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CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—
Is this a New Idea?..... 145
Another Injunction Secured at Cleveland..... 145
The Market for Gas Securities..... 146
*Some Experiments on the Revivification of Oxide of Iron in Closed Boxes..... 146
*Some Notes of Experiments on the Position and Working of the Hydraulic Main..... 148
Timber Piling in Foundations and Other Works, by Mr. H. Adams —Continued from page 113..... 150
*Bredel's Improved Gas Retort..... 152
An Ingenious Arrangement of Power..... 153
*The Campbell Ammonia Engine..... 154
Analysis of Three Samples of Crude Petroleum..... 154
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 155
Break in Main at Joliet, Ill.—City's Share of Gas Trust Earnings, Chicago, Ill.—Fort Wayne Electric Company to Erect Plant at Wheeling, W. Va.—Increase of Capital at Macon, Ga.—Annual Election, Albany, N. Y.—Ditto, Rutland, Vt.—Ditto, Beverly, Mass.—Cost of Electric Lighting, Topeka, Kas.—Gas Inspector for Memphis, Tenn.—Reduction in Rates, Wilkes-Barre, Pa.—New Gas Works for Altoona, Pa.—Public Lighting, Kansas City, Mo.—Mr. Wilkiemeyer at Evansville, Ind.—And Other Items.

IS THIS A NEW IDEA?

Quite recently a well-known inventor and promoter of fuel gas schemes advanced the following idea of the possibilities of fuel gas. Said he: "Now, take a city like N—. It has not its superior, in a manufacturing sense, in this country. Right near the gas works are located a large number of iron works and other manufacturing establishments, all of which could use my gas, or *any* gaseous fuel, to advantage; and all could be easily reached by a very reasonable expenditure of money for pipes. It is a demonstrated fact, which I can prove to all who are interested in such matters, any day in the week, that gas is profitably employed elsewhere—not so very far from N— either, in the very branches of manufacture, or closely resembling them, surrounding the gas works to which I have referred. I do not mean natural, but manufactured gas. If a works for making fuel gas on my plan, or one equally as good, if there is such a one, which of course I doubt, were to be established there, it would soon be called upon to furnish very many millions of cubic feet of gas *by day*. I would of course sell this gas at a very small profit; say five cents per thousand cubic feet. That strikes you as very small, does it not? But remember that the railroads are carrying passengers for five or six miles, with a profit, at a charge of only *one little cent*—think of it—and yet are doing a splendid business, because, by reason of the low fares, they carry thousands of people where only tens traveled before. It is the large number of people carried that enables them to thrive on so small a margin of profit, and it is because of the many millions of cubic feet of gas which would be used, if sold as cheaply as I would propose to sell it, that I could afford to do it at a profit of only a nickle a thousand. Manufactories would crowd around an enterprise of that kind, as they do around natural gas centers. In that way a large quantity of gas could be disposed of at a very small cost for distribution. I can safely say that 12,000,000 to 20,000,000 cubic feet of fuel gas could be disposed of each day, within the radius of half a mile. At night I could turn my apparatus into illuminating gas generators.

"I would not need any gasholders, scarcely, because, by reason of the large number of generators required to supply the day demand, I could make the gas faster than it is required at night, for the few hours of heaviest consumption; and even then it is quite likely that I would not need *all* of my available generators. Or, I might say to the gas company, I will put gas into your holders for much less than you can manufacture it. Do you not suppose the company would consider the matter, and if it found I could do it, accept such an offer? Well, I guess, yes. That which holds good of N— can be applied to any other place. We can now make fuel gas nearly as cheap, and in some cases cheaper, than natural gas can be piped and delivered for. This is a serious matter, and one worth thinking about. What I have said is bound to come, and very soon at that. Not only the methods of manufacture, but especially the methods of application needed, have been greatly improved of late. Suppose I were to erect 30 of my generators. Well, *you can figure the cost*. These could turn out 15,000,000 cubic feet of gas in 24 hours, or 625,000 cubic feet in one hour. Suppose I sell only 10,000,000 cubic feet at five cents per 1,000 profit. It is $500 per day. Do you think it will pay? Think it over, my boy."

So spoke the fuel gas man. He gave facts and figures which seemed to strengthen his position at every turn, and while he was talking, and the JOURNAL man was listening and *thinking*, it occurred to him that it would not be so bad an idea if gas engineers and gas companies were to look at that phase of the fuel gas question. As the "Fuel Gas Man" said that the idea was not patented, *because he could not get a patent for an idea*, we herewith print it for the possible, though not probable, vacation reveries for the benefit of "whom it may concern."

ANOTHER INJUNCTION SECURED AT CLEVELAND.

It will be remembered that some months ago the City Council of Cleveland, O., passed an ordinance reducing the price to be charged for gas in that city from $1 to 60 cents per 1,000 cubic feet. The Peoples Company brought suit to enjoin the publication of the ordinance (thus rendering the arbitrary act wholly inoperative), and on July 27 Judge Stone rendered his decision in the case. The attorneys for the city de-

murred to the petition of the Gas Company upon several grounds, particular stress being laid in the argument upon the fact that the courts could not interfere with the passage of an ordinance and thus block the wheels of legislation. Judge Stone first made a careful review of the case and of the arguments advanced by both sides. "At the very beginning of this inquiry," continued Judge Stone, "it is necessary to determine whether the Court can interfere with the promulgation of an ordinance and prevent it becoming operative. This being determined, the consideration of other questions involved becomes unnecessary. There is no better principle of law, I take it, than that the Court cannot undertake to interfere with the passage of an ordinance, when it lies within the power of a body to legislate on the subject upon which they undertake to legislate. The Courts cannot, under such circumstances, interfere by equitable means with the passage of an ordinance. There is no question that in Ohio the Council of a city has it in its power to legislate upon the subject under consideration and has a right to fix the price of gas furnished to its citizens and itself. That is provided for by statute, and it has been declared again and again that a Council has such power. The prime question now is, had the Council proceeded so far that the Court may interfere to prevent the ordinance becoming operative? An ordinance of this kind requires publication to make it effective. Undoubtedly the Council passed the ordinance, it was signed by the proper officer, and publication was undertaken. I know of no case exactly parallel with the one under consideration. None have been presented to this Court in argument, and, after a careful search, I have been unable to find in other places one precisely like it, where there was an application to prevent the publication of an ordinance. There is a great array of authorities, found in all parts of the United States, where the court held that it was not proper to interfere with the passage of an ordinance." The Judge here cited several well known cases, among them the suit of the New Orleans Elevated Railroad Company against the Mayor and Council of the city of New Orleans. "The principle that underlies these causes," said Judge Stone, "is that not until the ordinance has become executory can its validity be judicially tested and determined. This ordinance will not be executory until after the proper and legal publication. Personally, I am heartily in favor of the interference of a court of equity, wherever it is shown to be necessary, but that does not at this time affect this question. It would be much better, if any damage has been done, that reparation should be made through a court of equity, than that the company should be compelled to bring hundreds of minor suits, the costs of which would be greater than the amount involved. If the Council here has passed an ordinance by fraud and has fixed the price of gas arbitrarily at so low a price that irreparable damage has been done the gas company, it is time for the interference of a court of equity. This, however, can be determined only by a full investigation. An answer should be filled and oral testimony in open court should be heard before there will be room for judicial interference. The court has no power at this time to interfere with the publication of the ordinance, but the courts of Ohio have had no difficulty in interfering after legislation has been enacted. It seems to us that this proceeding on the part of the gas company has been prematurely brought and the demurrer, for these reasons and on these grounds is sustained. The petition is dismissed."

Judge Sanders, one of the council for the gas company, gave notice of an appeal to the Circuit Court. Within ten minutes after Judge Stone had rendered his decision dissolving the injunction, a new one had been issued by the Circuit Court. The attorneys for the gas company anticipating defeat, had prepared a restraining order covering the points at issue, and they presented the matter before Circuit Judge H. J. Caldwell. He gave the subject favorable consideration and affixed his signature to the order. By the terms of the injunction the city officials are restrained from proceeding with the publication of the ordinance, and they were ordered to withdraw the manuscript if it had been placed with a newspaper for publication. The moment the order had been signed copies were taken to the City Hall and served on the officials.

The Market for Gas Securieties.

But few changes in quotations are to be noted in the city market for gas shares, Consolidated selling to-day (Friday) at 92¼–93, Mutual showing some advance at 118, with Equitable at the same figure. A cash dividend of 3 per cent. has been declared by the Boston Gas Syndicate, payable 1st inst. The following Massachusetts Companies have also declared semi-annual dividends: Northampton Gas Company, 4 per cent.; Easthampton Gas Company, 4 per cent.; Salem Gas Company, 3 per cent.

Some Experiments on the Revivification of Oxide of Iron in Closed Boxes.

[A paper read by Mr. F. G. Dexter at the Twenty Seventh Half-Yearly Meeting of the Southwest of England District Association of Gas Managers. Reprinted from the London *Journal*.

Some time ago the idea occurred to me to try to reduce, or obviate entirely, the cost of emptying and refilling purifiers. The opinions expressed in existing accounts of attempts to revivify *in situ*, by the admixture of air with the crude gas, being somewhat divided as to whether any reduction in the illuminating power of the gas does or does not result from this practice, I wished to try revivification on boxes "standing off" as foul, and therefore altogether out of contact with passing gas—a process which, if successful, would effect great economy, avoid a standing nuisance, and meet the scruples of those who, though acknowledging the desirability of reform in this department, objected to effect it at the risk of lowering the illuminating power of the gas.

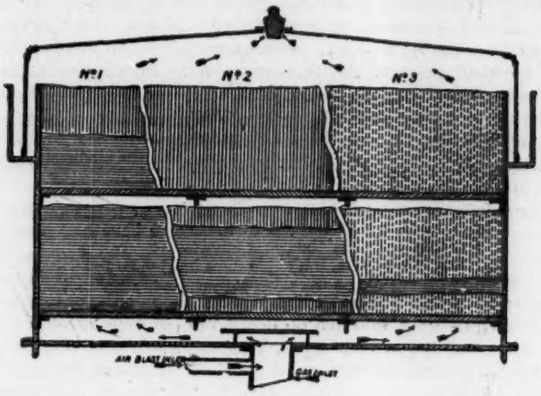
In commencing the experiments, I had the fixed idea that we dealt with a solid body capable of undergoing particular changes by the application of coal gas under certain physical conditions of rate of flow and pressure, and that this material, when fouled, could be made to undergo the reverse changes by the application of another gas, oxygen; and therefore, if this second gas were applied to the spent material under similar conditions inside the box, then the reverse action—revivification should be effected without difficulty. I had constructed a small test-box, made to scale of one of the purifiers on the works. The inlet in the center of the bottom was connected direct to the inlet main of the purifiers, and also by a branch service, controlled with taps, to a small holder containing air. On the top of the box, in place of the usual vent plug, a leak detector was fixed; and in one corner a pressure gauge. First filling the box with fouled oxide taken from a purifier just shut off, I carefully passed the air through until it appeared revivified, and then shut it off entirely, to wait until the same oxide, taken from the works purifier, had been renewed in the ordinary way, and put back. The foul gas was then sent into this box, and at the same time a small quantity, in proportion to the hourly make and the size of the test box, was turned through that. By this arrangement I had two purifiers, each purifying coal gas the same consistency in proportion to their respective capacities, and both filled with the same oxide, but with the difference that while the oxide in the works purifier had been revivified as usual, that in the test box had been revivified by a current of air passed through it. It will be understood that the registration was obtained by the station meter on the one hand and the leak indicator on the other. The gas was carefully tested every hour.

The result of this experiment was that the works purifier ran 14 days without showing any trace of sulphureted hydrogen, while the test box lasted three days longer. When fouled, I revivified the test box by the air holder as before, and then again worked the foul gas through; repeating this alternately with perfect success so often that it seemed waste of time to further prolong the experimental trial with the test box. Accordingly, to the inlet main of the works purifier I attached a 2 inch air pipe, which was carried through to the engine house, and attached there to a small pressure blower, the pulley of which was driven direct by a belt from the flywheel of the exhauster engine. My intention was to reproduce the exact conditions of the test box on a larger scale, when it seemed to me that success was certain to follow.

The drawing I have prepared is a section of the purifier, and represents in transition the conditions of three distinct series of trials. Section No. 1 shows the first attempt. In this case I had a free current of air passing up through the box, and escaping by the top center plug, as shown. The pressure in the box was $\frac{3}{10}$ths of an inch; and it took three days to revivify 8 inches of the top layer of material [shown by the vertical shading in the section]. Then with a sharp line of demarcation, the foul oxide [shown by the horizontal shading] commenced, to all appearance, as bad as if no air had ever passed. Complete revivification was effected in about eight days. This result clearly proved that the conditions of revivification differed from those of the test box, and the difference was this: During the test box trials, the air was filtered through at slow velocity and under the same pressure as obtained in the box during the passage of the coal gas; but in the trial of the works purifier, above alluded to, a large volume of air passed while the pressure was only $\frac{1}{10}$ths of an inch. To obtain the increased pressure required, I introduced counter-shafting between the exhauster engine and blower; and after fouling the box again, the air was turned on at a pressure of $\frac{7}{10}$ths of an inch, and the flow diminished by the plug at the top being set partially open with small wedges. The greatly improved result of this change is indicated by section No. 2; the air having pene-

trated in the same space of time right through the top layer, and a small portion of the second. In addition to this, revivification had set in to some extent at the bottom. Complete renewal was effected in five days.

After several other trials to settle satisfactorily in my mind some points that occurred to me as worthy of closer investigation, I began the next



and last series of trials, shown by section No. 3. Into the same box, fouled as before, the air blast was turned at a pressure of 1½ to 2 inches, and with the flow still further reduced. In two days the box was revivified through the top layer [see dotted lines], and very nearly through the second; the narrow streak of 3 inches that remained being disposed of well within the third day. In this case also revivification had set in to a slight extent from the bottom upwards, independently of the principal action downwards. I did not experience any difficulty in repeating these results on the same box several times over; but as they pointed all through the experiments to the necessity of reproducing, as nearly as possible, the same conditions in the box during revivification as obtained during the fouling of the oxide by the coal gas—that is to say, a slow movement of air, producing lengthened contact with the oxide, at some degree of pressure—I greatly desired to work up in one, or at the utmost two more stages, to the final conditions of air current and pressure used in the preliminary test box experiments, when to revivify a box completely should take some 24 to 30 hours only, and thus reduce the process to limits thoroughly practicable and convenient.

Unfortunately, having but the smallest size pressure blower fixed for these trials, I found that its capacity had already been reached, and the maximum pressure wanted—6 inches—could not be obtained without so far reducing the current as to impair the results. Being at this time about to remove to take my present appointment, I had no means of getting a larger pressure blower fixed to bring the trials to a final issue, but only to establish the fact that any reduction, either in the pressure or quantity of air used during the trial represented by section No. 3, led to a prolongation of the time required for revivification.

In case it may not be very clear to some why importance is attached to the question of pressure when we are considering purely chemical reactions, I would explain that it is simply to the physical, and not the chemical aspect that it has reference. For instance, comparing sections Nos. 1 and 3, there was no appreciable difference in the efficiency of the revivified oxide—the chemical part of the work being equally well done; but, compared on the time basis, No. 3 section is in advance of about 400 per cent. on the results of No. 1 section. The condition of pressure simply enables the air to penetrate the pores of the oxide in sufficient quantity within a practicable space of time.

Circumstances preventing my following up the results just now, I have determined to place them before you as they stand, in the hope that they may interest, or still better, incite some to take up the thread and bring the work to a satisfactory conclusion. Many of the features of these experiments appearing strange to me, I read up as much information as I could find relative to the behavior of oxide as used for purification; and in doing so I discovered that, some time previously, attempts to revivify oxide upon somewhat similar lines had been made, and had proved quite successful up to the third or fourth renewal, when the back pressure brought about by the coking of the oxide became prohibitive. It appears, however, that the air blast was obtained by means of a steam jet injector. This fact—the presence of the steam—is, to my mind, largely responsible for the back pressure recorded; as the soddening effect it has on the oxide has doubtless been noticed by those who have had occasion at any time to steam the plant anywhere near the inlet to the purifiers. Of course the oxide does harden to some extent, as in every other process of revivification *in situ;* but mere back pressure, within reasonable limits, in the boxes or anywhere else, is nothing to be afraid of, so long as it is kept off the retorts. It is, after all, a question of degree; the working pressure during the summer in certain works being a great deal heavier than at others under maximum strain in winter. I am quite sure, also, from the results obtained during the experiments, that the oxide in use in different works might be readily treated with some opening material, to counteract any excessive caking tendency.

With regard to the possible objection entertained by some, that great risk is run of the box overheating and firing, I would say that it is a point which need not be feared in the slightest degree with ordinary care. The heating being due to the chemical reaction of the sulphide of iron and oxygen of the air supply, the temperature reached in the box depends entirely upon the quantities of these substances brought into contact within a given time; and it is a simple matter to keep the air supply checked within the necessary limits until the more violent action is over. In practice, I found that the box reached within the first two hours the maximum temperature which appeared to be safe, and that after this it rapidly cooled; so that in about 2½ hours from the start no further attention was necessary—the air blast being turned on fully and left to do its work.

The action which has puzzled me most is the behavior of the oxide under the air blast, as indicated in the drawing. I fully expected to find that, as the oxide is fouled from below upwards, in the direction of the flow of the gas, the introduction of the air in precisely the same manner would lead to revivification in an upward direction, with the flow of air. But the very reverse took place—the air passing right through the whole bulk of material, and then revivifying from the top downwards. It was only after prolonged contact that any revivification was noticeable at the bottom, where the fresh air came into contact with the oxide first, and then only to a slight extent. In the middle space also, where air would be assumed to collect, not the slightest indication of revivification manifested itself until the top layer was wholly revivified; and then the action continued downward through the second layer, in like manner to the first.

Another important point which should be clearly understood is, that I could never discover any transition stage, as it were, or band of partially revivified oxide, between that already renewed and the foul material. Sections of the oxide taken at all stages revealed the conditions I have depicted in the drawing; the revivified oxide being in close contact with perfectly foul material. I wish it to be distinctly understood that each section represents the conditions over the whole box; the sharp line of demarcation extending horizontally with perfect uniformity right across. Repeated examination of the corners, middle, sides, and ends gave me the same result; no single instance occurring of greater penetration of the air in one part than another. This examination also disposed of the idea that once occurred to me—that the air had by some means taken a short cut through fissures in the oxide, or loose sides, and so found its way through to the top first. So that the only explanation of the phenomena that presents itself appears to rest on the assumption that some series of chemical reactions occur during the passage of the current upwards, unless it may be met by the simple fact that the air really does act equally throughout the oxide; but inasmuch as the oxide is the most fouled at the bottom, and is proportionately less so towards the top, the effect of revivification is seen to progress in apparently the reverse direction, from the top downwards through the material, requiring longer contact in proportion to the work it has done. In any future experiments that may be attempted, it might prove desirable to introduce air between the layers of oxide as well as below.

I trust it will be clearly understood, by those gentlemen who freely advocate the air process as ordinarily understood, that these remarks are not made in any sense of rivalry to that. Personally, I consider the ordinary air process of greater value than that put before you now; and the pure oxygen the best of the methods of dealing with our solid purifying materials. But for a time there are not likely to be many in a position to deal with oxygen: and although the ordinary air process will deservedly become more largely adopted than it is now, there will remain many hard worked managers who, without skilled assistance, and unable to devote the necessary attention themselves, would fear to risk the introduction of either air or oxygen with the gas. To these especially, some such process as the one now before you, requiring, at the most, two or three hours' attention each time a box has to be renewed, ought to be of value.

Glancing for a moment at the question in its general aspects, we see that, being able to purify coal gas by contact with the solid material,

oxide of iron, we effect this contact by bringing the gas to the solid body as a more expeditious and economical method than any attempt at a reverse order of things could possibly be. So far, so good. But this same solid material is capable of being again rendered fit for purification, not by the laborious application of other solids or liquids (when some excuse for the wasteful and costly system of its removal from the boxes would have existed), but by the simple application of another gas—oxygen—either in the pure state, or mixed with nitrogen as air. Why, then, having once practiced economy, do we throw our ideas of economy to the winds—*i. e.*, the oxide to the air? I think this question cannot be answered without admitting the room for improvement, especially in these days of keen competition and high priced, though uncertain, labor; and I feel sure that, in the near future, the use of solid materials for purification will only be tolerated in conjunction with some revivifying system which admits of its prolonged use without removal. This done generally will leave the gas manager one advantage the less to make use of to widen the gap between the industry he guides and its many competitors, but it will also be one step nearer that degree of perfection which it should be the aim of every man to reach.

Discussion.

The President remarked that they had listened to a paper bearing upon a subject that had occupied a prominent position lately, and on which almost all members could say something.

Mr. N. H. Humphrys asked if Mr. Dexter had any idea of the volume of air passed through the purifier in the course of revivification.

Mr. A. Thomas (Cowes) considered the paper an excellent one. He might remark that 30 years ago Mr. J. Esson, of Cheltenham, tried some experiments on similar lines. The purifiers were on the overhead system; and a 9-inch pipe was laid to the inlet, and air was driven through it by an exhauster. He (Mr. Thomas) was foreman there at the time, and helped to put up the pipes; but he happened to leave for another appointment before the system was actually tried, and therefore he had never heard the results. The difference in pressure evidently had a great deal to do with the time required for revivification; and the greater the pressure, the more rapid the result. He would like to know if this held good up to the highest degree of pressure the purifier would stand, or, if not, the highest limit to which Mr. Dexter would be inclined to go. He would be glad if the result asked for by Mr. Humphrys could be arrived at; but the question should be coupled with the weight of oxide acted upon. Some idea could then be formed as to the quantity of air required per ton of oxide; and then it would be a simple matter to arrange for the supply of this quantity.

Mr. Riley thought the particulars given in the paper seemed to point to the fact that the actual volume of air passed through the purifier was of no practical consequence. The actual application was most simple. The purifier was shut off, the air pipe connected, and air forced in at the highest pressure practicable. It was rather a question of the number of hours required for the revivification of a purifier than of the quantity of air admitted. The plan would be very useful in works where the purifiers were small in area; and he would be glad to know if it would be safe to increase the pressure, and so hasten the time occupied in revivifying, to a greater extent than Mr. Dexter had carried it. Referring to the third experiment carried out by the author of the paper, he asked if the narrow band of unchanged material shown in the drawing possessed any physicial peculiarities—in other words, if the material was more dense or closely packed at that part.

Mr. Brierly thought the experiments described were of an interesting character, particularly with regard to the property of the material to revivify downwards. Every chemical association required a certain minimum of time for working. The greater the pressure, the greater would be the penetrating power of the air into the oxide. Another point was the effect of friction as regards the action at the bottom of the box, compared with that towards the top. Friction meant increase of temperature; and this, in its turn, meant greater chemical activity. The temperature would be higher towards the top of the box; and perhaps this was the reason of the more active operations that evidently prevailed there. As to the quantity of air required, this would depend not only upon the weight of oxide to be revivified, but also upon the efficiency, as shown by the percentage of oxygen actually absorbed, which could be ascertained by analyzing the air escaping from the plug; besides which there was the effect of pressure. Possibly a greater efficiency obtained at the higher pressure. The slower the velocity of the current of air, the smaller the percentage of unused oxygen that would escape.

Mr. A. Stephenson (London), in response to the invitation of the President, said that in revivifying *in situ* the real question was the percentage of sulphur contained in a combined form in the material; or, in other words, the percentage of sulphide of iron. An important consideration in connection with this matter was the liability of the oxide to heat during revivification. This varied according to the age of the material; and new oxide was more likely to fire than that which had been used for some time. Unless the air was admitted cautiously, the material would become hot, and the grids would be burned. He had known the plan described to be tried at several places, but rejected on account of this liability to heat. Then some preferred to admit a small percentage of air with the gas; and certain of his friends claimed to be able to use as much as 4 per cent. of air without spoiling their gas. But he thought in that case the air must be of very superior quality. He considered that Brin's oxygen process presented by far the best means of revivifying *in situ*. Perhaps Mr. Dexter could say something about the age of the oxide he used.

The President thought the meeting had heard a good paper, and some practical remarks upon it. He had had no experience himself in revivifying by blowing air through the purifier. It would be a good thing if some regular rule or plan for revivifying *in situ* could be arrived at; and the use of pure oxygen was certainly far in advance of air.

Mr. Dexter, in reply, said that no doubt the question raised by Mr. Humphrys, and subsequently by Mr. Thomas, as to the quantity of air required, was interesting; but he did not think it was of any practical importance. No one ever troubled about the volume of air that came in contact with the oxide in the revivifying shed. He had aimed at bringing the air to the oxide instead of taking the oxide to the air; and he really could not get at the volume of air sent through the purifier. As to the limit of pressure, he saw no reason why any pressure short of forcing the lutes should not be used. As already explained, he was unable to obtain a higher pressure with the blower at his command; otherwise he would have tried an experiment at 6 inches pressure. He did not think the friction between the air and oxide could be of much account, though the question of temperature was undoubtedly of importance. In the second and third experiments, although the pressure was greater, the actual velocity and quantity of air passed was considerably reduced. In reply to the question about the narrow band of black in the third experiment, he did not notice any difference in the hardness of the oxide at that point. Every chemical action required time; and at the highest pressure any given particle of air remained in contact with the oxide for the longest period. The percentage of sulphur in the oxide he used was 20; and it was raised up to 50 in the test box by the repeated experiments. The tendency to heat was greater as the percentage of sulphur increased; and in the last few operations he had to reduce the velocity of the air, so as to keep down the temperature. The heating was entirely under control. No doubt it was possible to blow up the box, or set the whole on fire; but there was no need to do so. It was merely a matter of adjusting the air supply.

Some Notes of Experiments on the Position and Working of the Hydraulic Main.

[A paper read by Mr. E. C. Riley, at the Twenty-Seventh Half-Yearly Meeting of the Southwest of England District Association of Gas Managers. Reprinted from the London *Journal*.]

I have consented to offer these notes at the request of our Secretary, under the following circumstances: In September last, I was unavoidably prevented from being present at the half-yearly meeting; and being somewhat interested in the subject on which Mr. Humphrys had undertaken to read a paper, I gave, in my letter to him, some memoranda of alterations made in the position of the hydraulic main in our retort house at Swindon, with the results. He was kind enough to consider the notes worth giving separately as a short paper at this meeting, together with any additional experience we might obtain from the winter's working. This is my explanation for bringing before you merely a simple statement like the present; but, knowing the difficulty the Secretary had experienced in obtaining papers, and desiring to assist him, as well as in compliance with an expressed wish from some members that actual practical results, obtained from alterations to, or experiments with plant, should be brought before the members for consideration, I have ventured to bring these notes before you.

I should state, first, that the North Wales coal which formed the bulk of our coal supply in the retort house to which I am referring, while yielding, on an average, about 10,000 cubic feet of good gas per ton, gave a very thick pitchy tar, which accumulated in the main, and gradually filled the bottom part with a solid deposit that eventually reached the dip pipe. Towards the end of the time when the bed should be dropped, it would be only with the greatest difficulty on the part of

the men that the dips could be kept sufficiently clear to get the gas away; and the frequent stoppages, and constant necessity for work on the top of the beds, were a source of great discomfort and annoyance to the stokers, as well as general loss of time and gas. The expense also, whenever a bed was dropped, of taking off the covers of the main, and chipping out the tough, pitchy mass with chisel-bars and sledge-hammers, was considerable.

The retort house contains seven through beds of seven retorts each, or 98 mouthpieces in all; and I decided to try the effect of raising one section of main for one bed of 14 mouthpieces. Accordingly, arrangements were made to lift No. 7 to the extent of 1 ft. 8 in.. or a total height of 3 ft. 2 in. from the top of the bed to the bottom of the hydraulic main, and work for a like period, with the same coal, and under entirely similar conditions to the adjoining bed, No. 6. As this was merely an experiment, the same ascension-pipes were used again; the additional lengths being made up by the insertion of a short flanged making-up piece between the top of the ascension pipe and the arch pipe, and a bend put in from the back of the valve to the collecting main running along the top of the bed.

We worked No. 7 bed with the raised main from Sept. 6, 1889, to March 17, 1890—altogether 192 days; and No. 6, the adjoining bed which had not been altered, from Sept. 9, 1889, to March 22, 1890, or 194 days. In the former, the tar remained all liquid during the whole winter—giving no trouble whatever; and when the bed was dropped, the contents of the main all ran out in a perfectly fluid condition. In the latter, the usual solid, pitchy mass was formed in the main, up to the level of the gas outlet; and the usual expense and trouble were incurred in cleaning out. In order to prove the matter still further, and make sure that the result was not merely some erratic effect of position in the house, or temperature and ventilation, or other mysterious cause operating in the particular situation of that special bed, I had No. 1 (which had always been the most troublesome on account of stoppages) altered in the same way, and worked it against No. 2, which was not altered; and here again the same results were obtained as with No. 7.

I considered this double test as sufficiently reliable to justify the alteration of the remaining mains in the house; and this was done in the autumn of last year (1890). This winter, although you are fully aware of the special demands that have been made on all gas manufacturers, we have practically had no trouble with our hydraulic mains or ascension pipes; and I am perfectly satisfied that the simple alteration to which I have referred has already more than repaid the expenses incurred in carrying it out, while it has immensely increased the comfort and facility of working for the stokers. I am not prepared to suggest that similar results will follow in every retort house, as I am satisfied that each manager must study his own particular case, and the construction of his house, the description and arrangement of his hydraulic and foul main, and, more especially still, the character of the coal he has to work with, all of which factors will have to be considered in deciding what steps should be taken to overcome the difficulty of thick tar deposits in his own works.

It will be remembered that one of the objects of the arrangement of foul and hydraulic main described by Mr. Humphrys in his paper read in September last year, was the maintenance of the contents of the hydraulic in a perfectly fluid state; but that the arrangement was only adapted to a main which was open throughout, and was practically inadmissible in the circumstances of the experiment I was trying, where the main was divided into separate sections for each bed. The different methods adopted respectively in aiming at a similar result merely illustrate the old proverb: "Many men, many minds," and show that there are often several paths leading to the same goal.

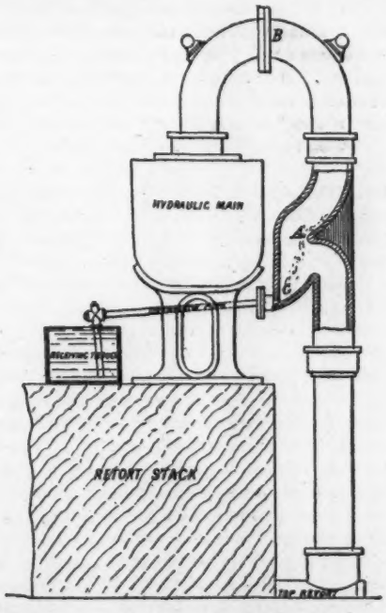
The gas from the separate sections of the hydraulic main passes through a bridge valve at the back into 8-inch collecting mains, which run the whole length of the house, parallel with the hydraulic on top of the bed, and in which the gas travels in a slightly ascending plane to the 12-inch foul main, which runs round the house, while the tar flows in the opposite direction to a separate pipe leading to the tar well. It will thus be seen that in the collecting mains the principle of the gas traveling in the opposite direction to the tar is adopted; while in the foul main itself the gas and tar flow together.

I am not prepared to offer any remarks as to the theory of the proper dimensions for the foul main; but I may mention in contrast to the illustration given by Mr. Humphrys of a make of 144,000 cubic feet of gas per day, where the suggested diameter suitable for the foul main was 19 inches, that in our Swindon house the maximum make is 500,000 cubic feet per day, while the diameter of the foul main is only 12 inches, and the length about 100 feet. Consequently, on the basis assumed—*i.e.*, that the capacity of the foul main should be equal to two minutes make of gas—our main is only about one-ninth the dimensions it should be, as the make per two minutes would be 694 cubic feet, and the capacity of the main only 78 cubic feet, while the rate of travel would be between 5 and 6 feet instead of 1 foot per second. Of course, I am aware that at the commencement of the works a nearer approach to the suggested theoretical position is attained; but the fact that ten years since, on the opening of the works, the make of gas per annum was 50,000,000, and that now it is 110,000,000, altered the ratio of the foul main to the make. But I think that the larger the works, the further will that ratio be from reaching the ideal theoretical standard to which I have been referring.

I have not taken the collecting mains into consideration, as only a portion of the gas made travels through the full length of the mains; but they would to some extent be a factor in the question of condensation, as well as the capacity of the hydraulic main itself—its outside surface area above the liquid level. I am, however, perfectly satisfied that a strong case has been made out by Mr. Humphrys as to the importance and value of the slow condensation afforded by a large and long foul main; and those of us who have alterations and extensions in hand would do well to give this matter every attention, and, for our mutual benefit, note the results obtained with altered plant, as compared with working under previous conditions. By this means, we shall make our meetings increasingly attractive and valuable to each other from a really practical point of view; and it has been largely with this hope that I have given the results of our experiments with the hydraulic main at Swindon. But, in proof of the effect of different kinds of coal, I may mention that at our works at Wormwood Scrubbs, near London, where a higher standard of illuminating power has to be maintained, and a different class of coal is used, no trouble is experienced with thick tar, although the hydraulic is right down on the top of the bed. When, however, owing to the delay in the supply, some North Wales coal had to be employed, the same difficulty arose, and continued until the other coal was received.

Discussion.

Mr. J. H. Lyon (Cosham) said he thought the kind of coal used had as much to do with the thick pitch in the hydraulic main as the position of this appliance. Mr. Riley got rid of the trouble by raising the main, which showed that it was caused by excessive heat received from the top of the stack. Apart from this, his impression was that the nearer the hydraulic was brought to the mouthpiece—*i.e.*, the shorter the ascension pipe—the greater was the risk of a deposit of pitch. At Manchester, considerable trouble was experienced from pitch and smoky mouthpieces; and Mr. Alderman King had introduced the arrangement illustrated in the drawing before the members, consisting of a sort of col-



lecting box inserted in the upper part of each ascension pipe. It was called a "Choked Pipe and Smoke Preventer." Experiments of long duration had proved conclusively that a certain condensation took place above the point *A*; and the greater the distance between this point and *B*, the greater was the condensation, and consequently the larger the

quantity of tar and liquor that would be collected. The Manchester Corporation Gas Committee had 250 of these appliances in use at their Gaythorn station; and they were going to increase the number to 700. At this station the tar and liquor collected and measured was, on an average, 1¼ gallons of tar having a specific gravity of 1.24, and 4½ gallons of liquor of 2° Twaddel, per ton of coal carbonized. The appliance was placed in the position shown. The condensed matter was collected at *C*, and carried away by the overflow pipe with the receiving trough. Taking it that each retort carbonized 10 cwt. of coal per 24 hours, the annual saving in tar alone by using Alderman King's apparatus was equal to 22s. per ascension pipe or mouthpiece, taking the tar at 1d. per gallon, or 16s. 8d. per ton. The result of using the appliance had been to get rid entirely of choked pipes and smoky mouthpieces; and if Mr. Riley adopted the plan, he would not only be relieved of such troubles, but add considerably to his yield of tar and liquor by collecting matters that formerly went back into the retort and were wasted.

Mr. A. Thomas (Cowes) noted the idea conveyed by Mr. Lyon. He understood Mr. Riley to say that in the first place there was 18 inches of clear space between the top of the stack and the hydraulic main; and that by practically doubling this distance he had got rid of the thick tar. He (Mr. Thomas) did not think that very much heat would be conveyed to the hydraulic main through a clear space of 18 inches; and he was therefore inclined to look in another direction for the cause of the improvement. Raising the hydraulic also involved the lengthening of the ascension pipes to a corresponding degree; and perhaps the additional 20 inches of pipe was really the means of preventing the thick tar from reaching the hydraulic. Evidently the evil was cured; but perhaps the longer ascension pipe had more to do with it than the additional space between the hydraulic and the retort stack.

Mr. J. Brierly (Borough Analyst of Southampton), in reply to an invitation from the President, said that although he was not a gas manager, as a chemist he was greatly interested in the matter before the meeting. Evidently there was a difference in the properties of the coals used at various gas works. At Manchester, the chief cause of complaint was smoky mouthpieces. But Mr. Riley did not mention these; his particular difficulty was thick tar or pitch in the hydraulic main. There was nothing before the meeting as to the different circumstances of temperature and conditions of carbonization that might or might not prevail at Manchester, Swindon and Wormwood Scrubbs respectively; but they would scarcely be so far dissimilar as to account for the variation in the results observed. The difference in the properties of the coals was evidently the chief cause. When the ascension pipes were lengthened, the effect was to increase the proportion of volatile matter that was condensed in the pipe and returned back to the retort. One effect of the alteration was that certain matters which formerly were carried into the hydraulic main were returned to the retort; and perhaps they were cracked up, and either wholly or partially converted into permanent gas. In that case, the alteration ought to have caused some improvement in the yield of gas per ton of coal; and he should be glad to know if this had resulted. If so, it would follow that some of the matters which formerly went to form pitch were now converted into gas.

Mr. W. Davis (Poole) asked for particulars as to the means adopted for drawing the tar from the bottom of the hydraulic. He found that when the hydraulic was so near the arches that it became considerably heated, there was a tendency to produce pitch. But by drawing away the tar from the bottom, he overcame this difficulty. Using a bridge valve, and taking the tar from the bottom of the main, would remedy the accumulation of pitch.

Mr. F. G. Dexter (Winchester) wished for information as to the effect of the alteration with regard to choked ascension pipes. He asked if Mr. Riley had been troubled with them either before or after raising the hydraulic. Also if the tar simply passed away over an overflow, or was drawn from the bottom of the hydraulic.

Mr. N. H. Humphrys said he was glad to see members coming forward with the results of personal observations conducted at their own works, and he believed this remark would also apply to the next paper. Theory and book learning were all very well in their way; but he took it that the object of gatherings like the present was to interchange personal experiences, and there could be no works so small or insignificant as to prevent the manager from making notes or observations that would be of value to his fellows.

The President said he had been brought up in two different schools of carbonization. In beginning, he had to do with iron retorts; and then, under Mr. Paddon, who had been Consulting Engineer to the Southampton Gas Company for 25 years, he was inducted into the clay retort system. With the iron retorts, they sometimes had choked ascension pipes; but never any accumulation of thick pitch in the hydraulic main. The tar and liquor flowed away with the gas; the gas went to the holders, and the liquids to the wells. But a day of change came, with good results to the shareholders; and the clay retort system proved that there was really more gas in a ton of coal than had been supposed. Other difficulties, however, came in, especially the thickening of the tar. Where did the extra gas come from? He used to suffer much from the thickening of tar; and a few years ago he read a paper before the Association on the subject of taking this product from the bottom of the hydraulic main. He gave therein the results of putting into practice ideas he had seen applied at other places with good effects. Since adopting this plan, he had not been troubled with thick tar in the hydraulic. It was very probable that the class of coal used was concerned in the matter. At Southampton he generally used Durham coal, which was known to be more troublesome than certain kinds in this respect, though giving good results in others. He took the tar out of the main as soon as possible, and allowed the dip pipes to seal in liquor only, and not in tar. The hydraulics were periodically flushed out with liquor; thus keeping the contents stirred up, and not allowing anything to settle. The tar pumped from the store wells was rather thicker, and gave more trouble to the distillers than that formerly yielded by iron retorts with a make of 8,500 cubic feet per ton.

Mr. Riley thanked the meeting for the kind reception accorded to his paper. He said his experience had run more in the direction of trouble from pitch in the hydraulic main than from choked ascension pipes, though he had these to deal with sometimes. He could not credit the alteration with any marked improvement in the yield. Coals varied in quality from time to time; so that it was difficult to make a close comparison. But he was under the impression that there was some slight increase in the production of gas. He might say that he had brought this subject forward in the hope that it might act as an example to other members, either to state the results of previous observations before the Association, or to undertake fresh ones with a view of throwing light on some of those points respecting which experience varied so greatly. He quite agreed with what had been said by the Honorary Secretary. With reference to Mr. Brierly's remarks, he agreed that the increased length of ascension pipe might afford some benefit as well as the reduction in temperature secured by raising the hydraulic main. The gas would reach the hydraulic at a lower temperature than before. So that both causes probably helped towards the result. With regard to taking off the tar, his hydraulics were in separate sections for every bed, with a bridge overflow at the back of each. Beyond this, no special means were used to take the tar from the bottom of the mains. He could not say that the alteration had led to any marked difference in the matter of choked ascension pipes; but he thought obstructions were rather less frequent now than they were under the previous working. The dip pipes had certainly required much less attention than before. He might say that at Wormwood Scrubbs they had to make gas of good quality; and they used a very high class north country coal, that would yield 11,000 cubic feet of 16 candle gas per ton.

[Continued from page 113.]

Timber Piling in Foundations and Other Works.

By Mr. H. Adams.

The sustaining power of a pile depends chiefly upon three circumstances: (1) the resistance at the point or shoe to further penetration; (2) the friction of the earth on the sides of the pile; and (3) the strength of the pile above the ground as a column. The first two cases are usually combined into one formula founded entirely upon experiments. The best known formula is that of Major Sanders, U. S. Eng., quoted by Rankine and Molesworth:

d = distance driven by last blow in inches.
h = height fallen through by monkey in inches.
W = weight of monkey in cwts.

$$\text{Safe load in cwts.} = \frac{W\,h}{8\,d} \quad \ldots\ldots (1)$$

This is the same as calling the safe load one eighth of the mean resistance to the foot-pounds energy of the blow, assuming it to be expended entirely in penetration without compressing the pile. Although this formula is good enough for ordinary cases, it will be instructive to compare it with other formulæ which have been given from time to time. *Engineering News* recently gave a formula as follows, H being fall in feet:

$$\text{Safe load in cwts.} = \frac{2\,W\,H}{d+1} \quad \ldots\ldots (2)$$

McAlpine's formula (Proc. Inst. C. E.) is—

Ultimate load = 80 (W + .228 $\sqrt{}$ H − 1).....(3)

and the safe load is assumed to be one-third of this for a dead load, or one-tenth if subject to vibration. In Weisbach's formula, e = average penetration of last 10 blows, M = weight of pile in cwts., then—

$$\text{Ultimate load} = \frac{W\,h}{e} \times \left(\frac{W}{W+M}\right)^2 \quad \ldots\ldots(4)$$

and the safe load is assumed to be $\frac{1}{10}$ to $\frac{1}{15}$ of this. Rankine gives a formula which takes into account the resilience of the pile. Using the same notation with the addition of s = sectional area of pile in square inches, l = length of pile in inches, E = modulus of elasticity, say, 1,000,000 pounds, then—

$$\text{Ultimate load} = P = \sqrt{\frac{4\,E\,s\,W\,h}{l} + \left(\frac{2\,E\,s\,d}{l}\right)^2} - \frac{2\,E\,s\,d}{l} \quad \ldots\ldots(5)$$

and factor of safety = from 3 to 10, the pile being driven usually until H = 2,000 to 3,000 pounds per square inch of the sectional area. In this formula, of the whole energy W h, we have $\frac{P^2\,l}{4\,E\,s}$ employed in compressing the pile, and P d employed in driving it. Rankine also states that the actual load applied varies from 200 pounds in soft ground to 1,000 pounds on reaching firm ground, per square inch sectional area of pile..... (6)

Molesworth (p. 116, 21st ed.) quotes a Dutch rule for the load a pile will bear, which takes account of the weight of the pile M, co-efficient of safety k = 10 for ordinary and 6 for steam pile drivers, and the average penetration e of, say, the last four blows.

$$\text{Safe load cwt.} = \frac{W^2\,h}{k\,e\,(W+M)} \quad \ldots\ldots(7)$$

W and M being in cwts., and h e in inches. D. K. Clark (Law's "Civil Engineering," p. 49) says that a pile 12 inches square, 20 feet in ground, will bear 9 tons in ooze or muddy sand, 12 tons in moderately compact clay, 25 tons in hard clay, and 80 tons if it reaches hard gravel; but this assumes the pile to be so supported throughout its length as not to be free to bend..... .....(8)

G. P. Bidder was of opinion that "in clay or wet soils it was not advisable to trust a greater weight that 12 tons upon each pile, but in gravel there was scarcely any limit to their vertical bearing strength".....(9)

R. P. Brereton made experiments up to breaking point on fir piles of various lengths and 12 inches square. Formula 12 has been constructed from the table in Law's "Civil Engineering." The average would appear to give a result as follows: r = ratio of length to diameter, then—

Ultimate load in tons = 120 − r..... (10)

with safe load, say, one fourth when stayed at 10 diameters interval; but it should be noted that the experiments here quoted appear to have been upon the unsupported length as columns, and not upon the bearing power as piles. Another formula, by Lieut. Sankey, for the strength of fir posts, is the following:

$$\text{Cwts. per square inch to crush posts} = \left(\frac{100{,}000}{500 + r^2}\right) \quad \ldots\ldots(11)$$

Factor of safety = 5. An approximate formula of the author's for maximum safe load in tons upon a fir pile as a column = $\frac{300}{r}$.....(12)

r being the ratio of unsupported length to diameter. From experiments by Kirkaldy upon baulks 13 inches square and 20 feet long, Riga crushed with 148 tons, and Dantzic with 138 tons..... .....(13)

Rankine gives for short fir posts, *i. e.*, under 20 diameters long, crushing load = 6,000 pounds per square inch, and factor of safety = 5, therefore, safe load = say, ¼ ton per square inch.....(14)

A formula founded on Gordon's, and agreeing fairly well with experiment for long fir posts, ends flat, is—

$$\text{Crushing load in tons} = \frac{3.25}{1 + .008\,r} \quad \ldots\ldots(15)$$

By this formula the baulks experimented upon by Kirkaldy would crush with 145 tons. A common rule for safe dead load on each pile is 5 tons per square foot of cross section in soft ground, or 1 ton per inch side of pile in firm ground..... ..... (16)

In Dobson's "Foundations and Concrete Works" (Weale's series), we are told that "of the comparative effect of impact and pressure in driving piles, we as yet know nothing, and the question is so complicated, from the great number of points that have to be taken into consideration in reducing the results of experiment into a definite form, from which some rule for our guidance might be obtained, that we can lay down in general terms the following empirical rule that, in *ordinary cases*, if a pile will resist an *impact* of a ton it will bear without yielding a *pressure* of 1½ tons," and he gives—

W v = impact, therefore safe load = 1.5 W v.....(17)

Dobson is, however wrong in his theory; he assumes that the force of a blow is measured simply by the product of the weight into the velocity, and this assumption leads him to conclude that a 1-ton ram with a fall of 16 feet will have the same effect on the head of a pile as a 2-ton ram falling 4 feet, while the former takes double the expenditure of power to raise it. In other words, he says $f = m\,v$, instead of $f\,t = m\,v$, which is the well-known formula where f = force, t = time, m = mass, v = velocity. That is, a force, f, acting for time, t, will move a mass, m, with a velocity, v. But action and reaction are equal; therefore a mass, m, moving with a velocity, v, and expending its energy in time, t, will produce a mean pressure $f = \frac{m\,v}{t}$. Weight = product of mass into force of gravity, or $W = m\,g$; therefore $m = \frac{W}{g}$, or $f = \frac{W\,v}{g\,t}$, instead of $f = W\,v$, as Dobson puts it. The same error is made by Molesworth, p. 117, and a table of results is given, assuming that the force of the blow varies as the square root of the fall, instead of directly as the fall. The product $m\,v$ gives the impact or momentum in its original sense, also known as quantity of motion; but it cannot be compared with force or pressure unless time be taken into account. A worked example will perhaps make this clear:

Let W = .25 tons, H = 20 feet, d at head of pile = ¼ inch, then $v = \sqrt{2gH}$ = 35.7 feet per second; but v varies from 35.7 to 0 while passing through the ¼ inch, therefore mean $v = \frac{35.7}{2} = 17.85$ feet per second, and ¼ inch = $\frac{1}{1\,6}$ foot, therefore time occupied in passing through ¼ inch = $\frac{1}{(17.85 \times 16)} = \frac{1}{285}$ of a second. Then by formula $F = \frac{W\,v}{g\,t} = \frac{(.25 \times 35.7)}{32} \frac{1}{285} = 79.5$ tons; but if the exact fractions be taken it will give 80 tons mean pressure. By formula $\frac{W\,v^2}{2g} = WH = .25 \times 20 = 5$ foot-tons, or a mean pressure of $\frac{5}{1\,6}$ foot = 80 tons as before. It will be observed that d is taken as the movement at the head of the pile, and attention must be directed to one very important point. The distance the head of the pile moves after being struck is the criterion of the resulting force in pounds; but only part of this force is returnable as supporting power; some of it is expended in compressing the pile, and any formula that does not take account of the compression of the pile as well as the penetration of the point can only be approximately true. The resistance at the head of the pile begins at zero and terminates at such a pressure that the total movement multiplied by the average pressure equals the foot-pound energy of the blow. This resistance may be shown approximately, thus: A B is the total movement of the head of the pile at the last blow, and the horizontal ordinates between A B and A C represent the corresponding pressure at each point of the movement, giving an average resistance of A D or B E, which is equivalent to the 80 tons just worked out. Suppose the point moves one-third of the distance moved by the head, then when the head has gone down from A to F the point will begin to move, dividing the triangle of resistances into two arreas, the upper one, A F G, representing the foot-pound resistance of the pile to compression with an average of A H or F J, and B F G C the foot-pound resistance of the point to penetration with an average of F K or B L; but B C represents the ultimate pressure or the resistance in pounds to further penetration, assuming that the resistance varies in direct ratio to the movement. B C is seen to be independent of F B, and therefore the supporting power must be measured by the movement of the head rather than by the movement of the point. Let movement of head A B = a, movement of point F B = b, ultimate pressure in pounds B C = c, W = wt, ram pounds h = fall in inches; then, $c = \frac{2Wh}{a}$ ....(18)

If it should be desired to measure the supporting power by the average resistance of the point to penetration at the last blow, let F G, the compression when point begins to move = p, B L the average resistance to penetration = q; then,

$$p = \frac{c(a-b)}{a}, \text{ and}$$

$$q = p + \tfrac{1}{2}(c - p) = \frac{Wh(2a-b)}{a^2} \quad \ldots\ldots(19)$$

For an arithmetical example, let W = .25 tons = 560 pounds, h = 20 feet = 240 inches, a = ¼ inch, b = ¼ inch; then,

$$c = \frac{2Wh}{a} = \frac{2 \times 560 \times 240}{.75} = 358{,}400 \text{ pounds} = 160 \text{ tons};$$

$$q = \frac{Wh\,(2\,a - b}{a^2} = \frac{560 \times 240\,(2 \times .75 - .25}{.75^2} = 298{,}666 \text{ pounds} =$$

133⅓ tons,

and the supporting power with a factor of safety of 10 would be 16 or 13⅓ tons, according to the view which is taken. In the above calculation, mathematical accuracy has been slightly sacrificed to secure as simple an explanation as possible, and the result must only be taken as a fair practical approximation to the truth. By formula—

$$\frac{Wh}{8d} = \frac{(5 \times 240)}{(8 \times .25)} = 1{,}000 \text{ cwt.} = 50 \text{ tons safe load;}$$

but taking d as movement of head of pile instead of point—

$$\frac{(5 \times 240)}{(8 \times .75)} = 333\tfrac{1}{3} \text{ cwt.} = 16\tfrac{2}{3} \text{ tons safe load,}$$

very closely agreeing with the previous calculations. By Dobson's formula, $Wv \times 1\frac{1}{2} = .25 \times 35.7 \times 1\frac{1}{2} = 13.4$ tons safe load—a striking similarity in this case, but a mere accident, as it will be observed that this result is independent of the distance any part of the pile moves, and is therefore no criterion of its stability. The agreement of a formula with a single average case does not afford any proof of its accuracy.

Since the introduction of Portland cement into ordinary building operations, the use of timber planking or piling in foundations has considerably diminished, and few architects of the present day would care to build permanent masonary structures upon a layer of perishable timber when imperishable concrete can be substituted. The old form of plank foundation or plank and pile foundation was relied upon in doubtful cases, to provide a firm basis upon which the superstructure might be raised, but its use now would be restricted to such cases as could not well be dealt with otherwise. For example, the author is at the present time erecting a range of offices and workshops, of corrugated iron and timber, covering three sides of a site 100 feet square, upon newly-made ground 8 feet deep. In this case the outline of the various walls is followed by a line of 9 inches × 9 inches creosoted fir piles, 10 feet long, average 12 feet centers, with 9 inch × 9 inch sleeper sills halved on and finished flush with the surface of the ground. In another case some large iron columns, carrying a short pier on the river Thames, were bedded upon two thicknesses of 4-inch elm planks, crossing each other upon a layer of cement concrete, about 2 feet thick and 12 feet square. The mud was excavated at low water so that the concrete rested upon a gravel bed. In the foundations of a 15-ton crane, upon made ground with a peaty substratum, piles and walings were used embedded in concrete. Generally piles would only be used for foundations on land when a firm substratum underlies a soft layer of considerable thickness, but even then, for important work, concrete piers and arches under the brick footings will often be preferred. At the Tilbury Docks, where some very economical work may be seen, some of the foundations, which were all on peaty ground, were formed of piles and concrete.

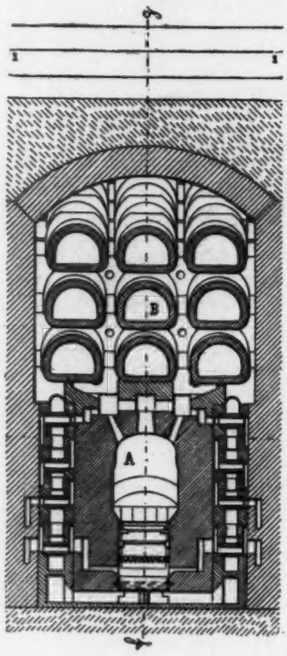
When the soil is soft to a considerable depth, it may sometimes be consolidated by driving piles into it, sufficiently close to each other to compress the intervening earth. For this purpose round piles 6 inches diameter and 6 feet to 12 feet long were formerly recommended to be driven at intervals of about 2 feet 6 inches center to center. The author has had no experience in consolidating earth in this way, and rather doubts the expediency of so doing. He has recently erected some large fixed cranes on 14-inch piles. The cranes, standing on a base 12 feet × 10 feet, are 40 feet high to top of pillar, have a radius of 50 feet, and carry a load of 30 cwt. to a height of 60 feet, making over 50 lifts per hour. To support these there are five piles along front and three at back, 14 inches × 14 inches, and 46 feet long, standing in 17 feet of water, 9 feet of mud and 12 feet of soft ground. A 25-cwt. monkey falling 3 feet to 6 feet drove them about 2 inches at the last blow. This was not quite satisfactory, as the statical load brought upon each pile by the loaded crane is 6 tons without allowing for the effect of a live load; but the author considered that the bracing to the surrounding piles was sufficient to secure the stability of this portion of the structure, and six month's working has brought about no signs of settlement. At the Poplar Dock a timber retaining was put in originally and afterwards increased in height. In such a case the tying back of the piles is an important addition to their strength. Straps and cotters are better than nuts and screwed ends, as the strength can be equalized more easily.

Brodel's Improved Gas Retort.

On June 23 United States Letters Patent (No. 454,514) were granted to Frederick Bredel, of this city, for improvements in gas retorts. Using the words of the specification, the inventor says:

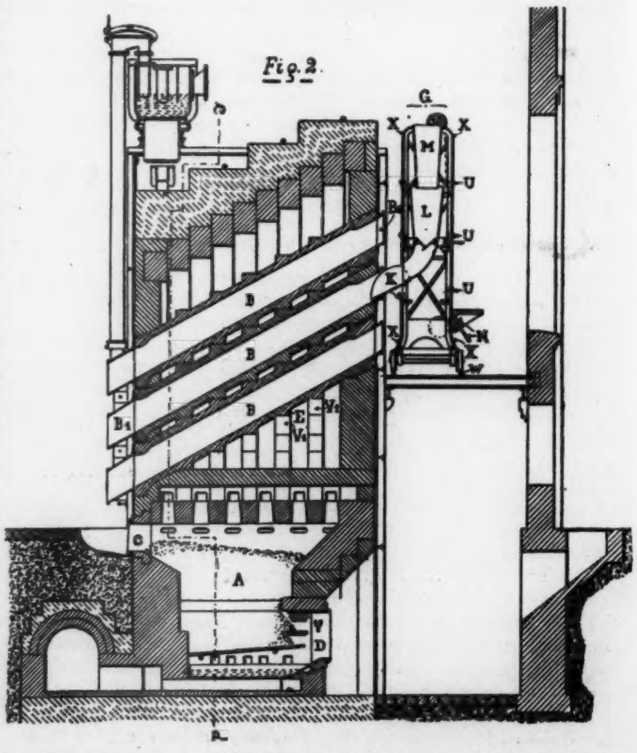
This invention relates to an improved setting of gas retorts used in the dry distillation of coal and other materials. The invention consists in retorts set upon an angle to the horizontal line. In the accompanying drawings Fig. 1 represents a vertical transverse view on the line *c d*, Fig. 2, of a retort furnace embodying my invention. Fig. 2 represents a vertical transverse section on the line *f g* of Fig. 1. Figs. 3 and 4 are detail views and section of supporting of retorts. Fig. 5 is an explanatory diagram. If reference is made to front of the bench, it at all times designates side on which the discharging mouthpieces lie. The opposite side is called the "back" of benches.

Fig. 1.



A designates a generator or fireplace with suitable grate lying partly or wholly beneath the retort setting, filled with combustible material, such as coke, coal, or other fuel, for the purpose of heating retorts *B*.

Fig. 2.



The fuel is supplied to the furnace through filling door *C*, which lies on the front side of the retort bench. The clinkering door *D* lies on the opposite back side of the retort bench.

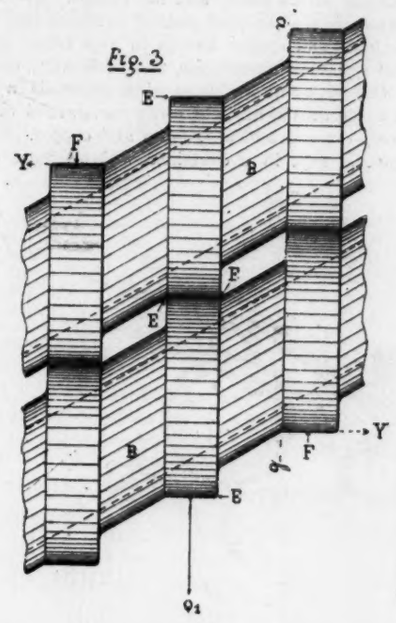
The object of this improvement is to do away with an excavation or

elevated stage floor on the discharging or front side of the retort bench, which would otherwise be necessary, in front of the bench, so as to enable the clinkering and cleaning of the fire and grate, and furnishing a suitable level to discharge the retorts.

E and *V'* designate a new and improved way of supporting retorts laid under an angle to the horizontal level, or commonly called "inclined" retorts, which is shown detailed in Figs. 3 and 4. Reference is also made to Fig. 5.

It has been customary in setting inclined retorts to support said retorts by blocks, tiles, or other suitable refractory material fitting the inclined angle of the retorts, Fig. 5, which has the disadvantage of prevent-

Fig. 3.



ing a substantial support of said retorts, for the reason that in this case, where the angle of supports fits the angle of inclined retorts, the weight of retorts will be diverted, as shown in Fig. 5, which shows plainly that the retort has the tendency to drive the supporting wall out of its vertical position in the direction of *P*, and gives the retort a tendency of sliding downward in the direction of *R*. To obviate this I construct the retort

Fig. 4.

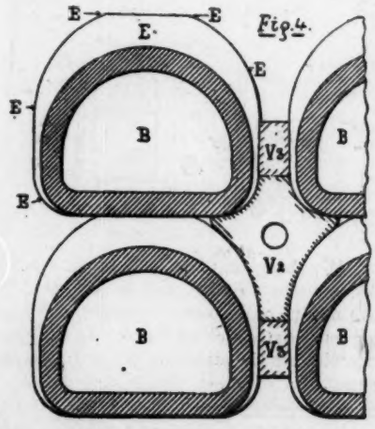


Fig. 5.

wherever the same is supported by piers *V'* and *V²*, which are on both sides exposed to the heat of the fire, with a circumferential ring *E*, which is made out of one piece and forms part of the retort *B*, and having a supporting surface *F*, horizontal in the direction of *Y*, or, in other words, to the longitudinal section of the retort, when the said retort lies on the supports, thereby giving a substantial support, preventing all sliding tendency and side pressure against supports, as force *Q'* cannot be diverted. A general idea of supports as arranged between retorts is shown in Fig. 4 by supports *V¹* and *V²*.

The improvement in charging inclined retorts consists in a particular construction of charging machine *G*. Heretofore great difficulty has been encountered in charging materials of different angles of repose in an inclined retort, such as naturally would be the case if, for instance, lump or fine coal have to be charged alternately in inclined retorts.

Lump coal would naturally roll off more easily than coal in a pulverized state. The result would be that lump coal would be heaped up in the lower part of the inclined retort toward the discharging mouthpiece *B'*, Fig. 2, while fine and moist matter would naturally not roll down as easily and thereby heap up on the charging end. This can be obviated by giving the different matters to be charged a different moment of inertia, providing all the time the retorts are laid under an angle suitable for the charging of the finest material under the highest moment of inertia to be obtained by the foregoing charging apparatus.

The charging machine is supplied with the material to be charged by suitable means from above. To prevent waste of material in filling the charger *L*, a funnel *M* is put in such a way that it will not interfere with the charger *L*, when the upper retorts are charged. If lower retorts are to be charged, the material can either drop from funnel *M* into charger *L*, or a telescoping arrangement can be made which will prevent the dust from flying around. The charger *L* can be raised or lowered by a hoisting arrangement *N*, constructed suitable for this purpose. A frame *X* and automatic catchers *U* are provided to keep the charger *L* and chute *K* in their respective positions to the height of charging mouthpiece B^3. Chute *K* is movable around point *T*, enabling thus to throw the chute *K* toward the charger *L*, thereby allowing the charging machine to move freely on rails *W* in front of and longitudinal to charging mouthpieces B^3. The charging machine *G* can be arranged to hold one or more chargers *L*, and one or more retorts can thus be charged at the same time. The gates *H* and *I* can be made each of one or more pieces.

No claim is made herein to the retort charging devices herein shown and described, as the same forms the subject-matter of a separate application filed as a division of this application.

It is deemed of special importance that the bearings be flat, and that they be distributed throughout the length of the retort, as shown, whereby endwise movement of the retort, when placed in an inclined position, is entirely obviated. A single flat bearing, and that at the end of the retort, has practically no effect for this purpose.

Having thus described my invention, what I claim to be new, and desire to secure by Letters Patent, is, a plurality of inclined non-rotatable retorts, each having a pluralty of peripheral flat bearing surfaces, arranged at intervals throughout its length at an angle to the retort, said retorts being supported one on the other with said bearing surfaces in contact, and columns or supports for the lowermost retort of gradually diminishing heights, and having their upper ends horizontal to correspond with and receive the bearing surfaces of the lowermost retort, substantially as described, and for the purpose specified.

An Ingenious Arrangement of Power.

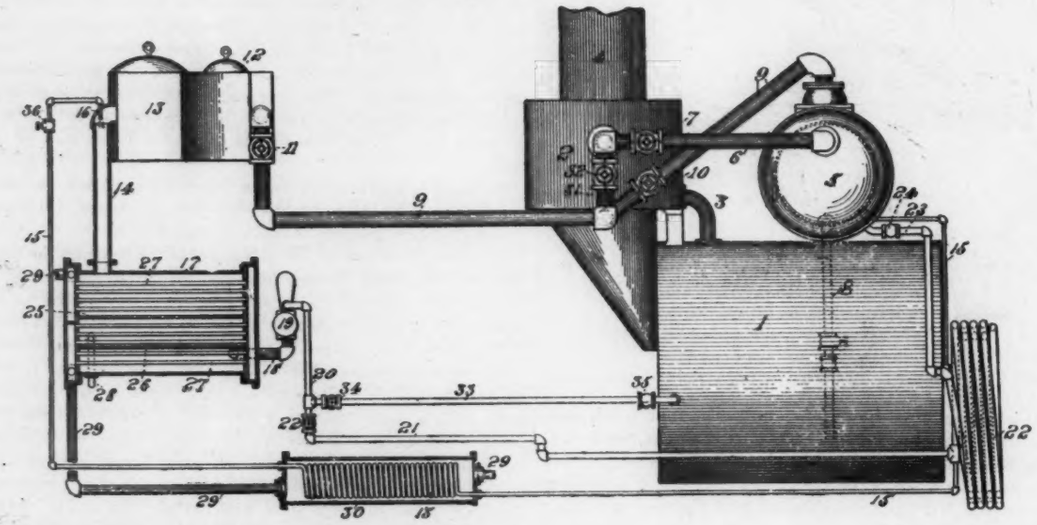
At the new works of the Newport News Shipbuilding and Dry Dock Company at Newport News, Va., the various shops are necessarily separated from each other, and the primary engineering conditions are such as to demand the subdivision of power almost as a necessity. The key to the successful subdivision of power was found in the use of a type of engine, whose specific economy in moderate sizes should be as good, or better, than that of a single large central engine; and further, in the use of some practical device for preventing the dangerous accumulation of water in an extended system of piping, and for returning all condensation to the boilers as a measure of economy. This contract, comprising engines and steam loops, was awarded to Westinghouse, Church, Kerr & Company, and comprises, up to date, seven independent Westinghouse compound engines, as follows: One of 80-horse power, one of 130-horse power, four of 200-horse power each, and one of 330-horse power, each protected by a separator and steam loop. A central boiler plant of high pressure boilers supplies steam to these engines, most of which are several hundred feet distant, and also to sundry pumps and other steam machinery. The steam mains, which commence with a diameter of 14 in., are laid in an interesting and original manner. To go overhead was out of the question, and the problem of an underground line was a difficult one, on account of the nature of the ground, which, for the most part, is soft silt, flooded at high tide. A subway was therefore constructed by sinking a large steel tube of sufficient diameter to carry all the steam and water pipes with the steam loop returns, and allowing ample head room for inspection. Y branches and eccentric re-

ducers are freely used, and expansion is taken care of by copper bends at the angles. The steel subway itself is used as a hot air duct, distributing from an indirect system with fan blast for heating the various buildings. High pressure steam at about 150 lbs. is carried through the entire system. The return system at present consists of 6 separators and 13 steam loops, all entering into one common 4 in. return, which lies parallel to the steam pipe in the steel tunnel above described.

The Campbell Ammonia Engine.

A contemporary says that the Campbell Engine Company, of 35 Wall street, New York, is engaged in exploiting the ammonia engine recently invented by Messrs. J. H. and C. H. Campbell. A tugboat, the "Edwin D. Hartley," 85 feet long, 18 feet beam and 8½ feet draft, having compounded engines, has been equipped with the apparatus, and has during the past fortnight made a number of successful exhibition runs in New York Harbor, which have been attended by many well known engineers, and in the meanwhile is regularly engaged in towing work. The boat was fitted with the Campbell apparatus in Philadelphia, and in the run from that port to New York did excellent work.

Fig 1.



The principle upon which the economy of the ammonia engine chiefly depends is the fact that with a given pressure of steam ammonia gas of higher pressure can be generated, the latter being used in the steam cylinders instead of the steam. In the accompanying cuts the parts of the apparatus are represented as follows: (1) steam boiler, (5) ammonia generator, (12) and (13) high and low pressure cylinders, (29) the regular condenser, (30) cooling coil, (22) equalizing coil. In Fig. 1 is shown a longitudinal section of the ammonia generator (5), and in Fig. 3 an end section of the regular condenser (29). The working of the apparatus is as follows: Steam is raised in the regular boiler, as usual. The ammonia generator (5), Fig. 1, which is constructed on the same principle as an ordinary tube boiler, is half filled with aqua ammonia. Steam is turned on through the pipe (6), Fig. 2. It runs through the tubes and out at pipe (8) and back into the boiler, having done all that is required of it, namely, heated the ammonia. It is then used over again without waste. The ammonia gas raised to high pressure in the generator (5) is carried by pipe (9) to the high-pressure cylinder (12); thence to low-pressure cylinder (13); and is then exhausted through (14).

The condensation of the ammonia gas is effected in the following manner: From the generator (5) is carried through pipe (15) a small stream of the liquid from which the gas has been previously expelled; on its way it is cooled first by meeting the ammonia returning from condenser in a coil (22), the pipe (15), which is the smaller, running inside of pipe (23) in the coil (22). Pipe (15) again runs through a cold water coil (30), and the liquid finally meets the exhaust in the pipe (16) in a full spray, immediately absorbing the gas, which goes into the condensers as a liquid again.

The process of condensation is similar to the ordinary steam method, with the exception of having a water trap (27) through which all return exhaust must pass, thereby assuring the complete condensing of any gas still existent. The pump (19) then drives the ammonia back to generator (5) in the same state as when first put there, and it is used over and over again.

Among the advantages claimed by the Campbell Engine Company for the use of ammonia instead of steam, it is said that a saving in fuel of 50 per cent. can be effected; it acts as a perfect cylinder lubricant, no oil being used; the steam boilers employed with the ammonia process do not require cleaning nor the use of a boiler compound, and it is claimed that they will do service fully five times as long as when steam is the motive power.

The Campbell system may be adapted to an ordinary engine, the special mechanism being very simple of application, and connected between the ordinary steam boiler and the engine. The only change necessary in applying the Campbell method to an ordinary engine is the removal of the brass and copper fittings in any valves or pipes that come in contact with the ammonia gas, and substituting iron and steel. If an engine were built with a view to using ammonia a considerable saving in cost might thus be made by using iron or steel everywhere in place of the more expensive metals, brass and copper. The idea that ammonia cannot be kept in a container without more or less odor

Fig 2.

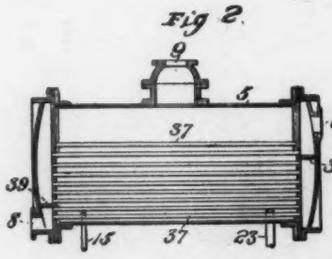
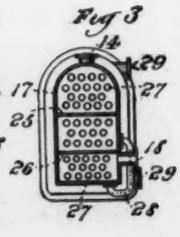


Fig 3



escaping has been proven by Mr. Campbell to be a mistaken one. He claims he can run for weeks, and that no odor will be detected. The system is applicable to either marine or stationary engines, with very slight cost in the latter, they being the less complicated. In the marine engine the system does away with the air pump and hot well, the regular steam condenser being used.

Analysis of Three Samples of Crude Petroleum.

By Durand Woodman, Ph. D.

[Read at a meeting of the American Chemical Society, June 5, 1891.]

1st. A sample of crude oil from the Lima, O., field. Sp. gr. at 60° F. (15.5° C.) = 0.835 (39° B.). Color, brown; slight fluorescence. Odor, peculiar and disagreeable.

2d. A sample of crude oil from California. Sp. gr. at 60° F., 0.835 (= 39° B.). Color, dark brown, opaque; no appearance of fluorescence except on dilution. Odor, peculiar; quite different from the Lima oil

and not as disagreeable. The odor of some of the distillates from these oils was much intensified.* Some of the California distillates had an agreeable odor.

Three hundred c.c. of these oils were taken for distillation. The receiver was changed at every 15 c.c. = 5 per cent. Thermometer bulb opposite exit of retort. Temperature taken at moment of removing the receiver.

Each distillation occupied four hours. The results are tabulated in the accompanying table:

Table of Distillates.

	t° F. Lima.	t° F. Cal.	Sp. Gr. at 60° F. (15.5° C.) Lima.	Sp. Gr. at 60° F. (15.5° C.) Cal.	°B. Lima.	°B. Cal.	Per Cent.
1	160°	160°	0.704	0.706	70.5°	70.0°	5
2	200°	184°	.723	.716	65.0°	67.0°	10
3	210°	200°	.737	.735	61.0°	62.0°	15
4	250°	218°	.752	.746	57.5°	59.8°	20
5	263°	222°	.767	.761	54.0°	56.0°	25
6	277°	218°	.778	.769	52.0°	53.8°	30
7	348°	....	.793	.777	48.0°	52.0°	35
8	354°	256°	.806	.791	45.0°	48 5°	40
9	370°	308°	.814	.808	43. +°	45.0°	45
10	400°	316°	.824	.818	41.0°	42.5°	50
11	427°	355°	.831	.834	40.0°	39.0°	55
12	....	425°	.830	.850	40.0°	36.0°	60
13	476°	430°	.831	.860	39.0°	34.0°	65
14	486°	490°	.835	.874	40.0°	31.0°	70
15	490°	490°	.834	.877	39 0°	30.5°	75
16	486°	484°	.830	.858	40.0°	33.8°	80
17	466°	500°	.825	.853	41.0°	34.8°	85
18	450°	485°	.826	.846	41. +°	36.5°	90
	Residuum		Solid at ordinary t°	Solid at ordinary t°	.....	.....	95
	Do.		Do.	Do.	.....	.....	100

The first nine Lima distillates (45 per cent. of the original sample) were water white and have remained so for many months. They were not "refined," but were corked up and set aside immediately after taking the specific gravity.

The tenth distillate was straw yellow, and the color increased to a dark brown in the eighteenth.

The first eight (40 per cent. of the crude oil) of the California distillates were water white, and have remained so.

The ninth was slightly yellow and color increased in the succeeding distillates.

Approximate Classification of Distillates.

	Lima.			California.		
Naphtha under 0.73 sp. gr.	10	per cent.	+	10	per cent.	+
Illuminating oil	50	"	±	40	"	±
"Lubricating" oils	30	"	±	40	"	±
Residuum	10	"	—	10	"	—

The California oil contained—

Sulphur (method of Carius)	0.18	per cent.
Sulphuric acid (oil washed and washings, represented by $BaCl_2$)	0.0003	"
Water	0.27	"
Paraffine	none separable.	

The oil remained perfectly fluid at — 26° F. (—32 C.), the viscosity at that temperature being apparently equal to that of "boiled" linseed oil. The heaviest distillates solidified at 0° F. (— 18° C.).

A second sample of Lima oil, received at about the same time as the foregoing, was a somewhat heavier oil. Sp. gr. 0.850 = 36° B., but not differing noticeably in appearance or odor.

It was separated into the following temperature fractions—

At 150° F.	0.0	per cent.	Sp. gr. — = — ° B.
" 250°	13.75	"	0.747 = 59.°
" 400°	35.11	"	.797 = 47.°
" 500°	7.93	"	.830 = 39.°
" 600°	13.40	"	.844 = 36.5°
" 600° +	18.60	"	.846 = 36.°
Residuum	9.65	"	....
Water	0.70	"	....
	99.14 per cent.		

Approximately:

Naphtha and burning oil	56.8 per cent.
Heavy oils	32.0 "
Residuum	9.6 "
Water	0.7 "
Sulphur, first determination	0.63 per cent.
Duplicate	0.68 "
Average	0.655 "

Notwithstanding the strong oder of the Lima oil, the sulphur present seems rarely to amount to 1 per cent. "Analyses of samples of crude Ohio oils from different localities have given on the average about 0.50 per cent. sulphur." (C. F. Mabery and Albert W. Smith. *Loc. cit.*, p. 234.)

Sulphur in crude Lima petroleum (average)	0.50 per cent.	Mabery & Smith.
Sulphur in crude Lima petroleum	0.553	Dr. Lord, Ohio Geol. Sur.
Sulphur in crude Lima (by Carius' method)	0.655	D. Woodman.
Sulphur in crude distillate (Lima)	0.52	Dr. Lord } "Economic
" " refined " "	0.36	" } Geology" vol.,
Another " " "	0.22	" } VI., p. 791.
Sulphur in Pennsylvania crude oil	0.18	D. Woodman
" (by combustion)	0.22	"

The removal of the sulphur compounds or the destruction of those accountable for the disagreeable odor in Lima oil is a problem still open for a satisfactory solution both in respect to expense and efficiency.

The study of the individual forms in which the sulphur exists, although a most tedious process, holds the surest promise of success.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE New Albany (Ind.) Gas Light and Coke Company has declared a semi-annual dividend of 3 per cent., payable at the Company's office on demand.

A BREAK in one of the mains of the Joliet (Ills.) Gas Company necessitated the shutting off of the supply to the city early on the morning of the 17th ult. The accident happened at 4:30 o'clock, and was instantly detected through the test lights. The shut-off lasted until the gas from a reserve holder containing some 30,000 cubic feet could be turned on, requiring about 20 minutes time.

THE following orders for automatic governors have recently been received by the Connelly Iron Sponge and Governor Company, of this city: Peoples, Brooklyn, N. Y., 20-inch; Savannah, Ga., 16-inch; New Orleans, La., 10-inch; Covington, Ky., 16-inch; Des Moines, Ia., 16-inch; Newburyport, Mass., 6-inch; Fort Smith, Ark., 8-inch; Jamaica Plain, Mass., 10-inch; Saco, Me., 10 inch; Auburn, N. Y., 12-inch; South Bend, Ind., 10 inch; St. Augustine, Fla., 12-inch. The last-mentioned is to replace a governor destroyed by fire some time ago.

SEVERAL capitalists said to be connected with a New York city Gas Company have lately visited Westfield, N. J., and have investigated the locality with the view to establishing a gas works there for the supply of Westfield, Cranford, and possibly Fanwood. Several attempts have been made to place an electric light plant in Westfield, but the place is still lighted by oil lamps. The town is at present paying about $1,000 for street lighting, and the Town Committee is said to be willing to grant a charter to any reliable Company that will introduce immediately either gas or electricity as an illuminating agent.

SUIT has been brought at Boston, Mass., against the New England Telephone and Telegraph Company and the Boston Electric Light Company by Thomas Gately, who wants $50,000 damages. He claims to have been seriously injured on January 12 by coming in contact with a broken electric wire and receiving thereby a severe shock. He says he has been unable to work ever since, and that he is probably incapacitated for future work.

THE Chicago Gas Trust paid into the city treasury, on the 22d ult., $37,500 as the second instalment of money under the ordinance requiring the payment of 3¼ per cent. of the gross earnings of the Trust. In June an equal payment was made, making $75,000 for the quarter. The city's gas bill for the last quarter was $128,000. The Companies contributing are the Chicago, the Peoples, the Equitable, the Consumers, the Hyde Park, the Suburban and the Lake.

A WHEELING (W. Va.) correspondent, under date of 22d ult., sends the following: "Most of the members of the Electric Light Commission (appointed to investigate and report upon the different systems of municipal electric lighting now in vogue throughout the country) arrived home last night, naturally much fatigued by their long trip, but with their minds and notebooks full of information respecting arc electric lighting. The Commission during the 15 days they were absent from the city traveled about 4,000 miles, passed through 11 States, crossing the full length of several of them twice, the list embracing Pennsylvania, Ohio, Indiana, Michigan, Illinois, Missouri, New York, Rhode Island, Connecticut, Massachusetts and New Jersey, in addition to which there was a run of 180 miles through the Province of Ontario, Canada. The cities visited for the purpose of inspecting plants and fac-

* C. F. Mabery (Am. Chem. Jr., 13, 232) notes that the sulphur compounds collect principally in the distillates of higher boiling points (300-300 degrees).

tories were Pittsburgh, Allegheny, Cleveland, Buffalo, Toledo, Fort Wayne, Chicago, St. Louis, Detroit, Albany, Boston, Providence, Fall River, Lynn, and other minor points, and about 25 separate establishments were examined, covering all the leading systems of lighting. At each of these cities, and at all the light stations, the engines, shafting, arrangement of machinery, location, number and size of boilers, arrangement of dynamos, switchboards, etc. were all fully inquired into, and on the streets the pole-line construction was always carefully noted by day, and the lamps inspected by night. At the factories the details of the manufacture of dynamos and lamps, were fully inquired into, and the advantages and disadvantages of the various systems carefully compared and criticised. All these and many other details occupied the time of the members very fully, and it is a matter for congratulation that upon no occasion, in rain or heat, did a single member of the Commission fail to keep an engagement or show any desire to shirk the labor inseparable from a faithful discharge of the duties incumbent upon him. It would, of course, be premature to indicate at this time the probable action of the Commission. But it is not going too far to say that most of the members know about where they stand, and while a careful consideration of the bids, in the light of the information gained, may make some changes in resolutions existing at the moment, it is probable that the members of the Commission will be able to come to an early decision, and that their recommendation will be laid before Council at an early date. The Commission are anxious to make all due haste in the matter, to the end that the building and outdoor work generally may be fully completed before the advent of bad weather. The engine or engines, which will probably be of the low-speed type, will be located in the center of the line of shafting, and the clutch-pully system of connecting the dynamos will be adopted as the best. All doubts, if any existed, as to there being enough ground at the gas works site, have been solved in the affirmative, and Engineer Seeley already has his draughtsmen at work. His amended plans will soon be in the hands of the Commission, and as soon as the size of the engines has been fixed by the Commission the interior of the building will be mapped out, and be in readiness to go to the architect to be selected. Members of the Commission show a disposition to make some very considerable changes in the number of lights, it being evident, from what they have seen, that in nearly all the cities the lights, being purchased from commercial companies, often at exorbitant prices, ranging as high as $150 per light per year, are too far apart on the streets to secure the best results. In an attempt to compensate for this lights are swung too high above the streets. It is the ambition to make Wheeling the best illuminated city in the country, and all efforts will be directed to that end. It is a matter for regret that every member of the Commission could not have taken the trip, but with 9 of the 12 members present, reinforced by the information previously obtained by the absentees, it is reasonable to expect a satisfactory and advantageous contract. Mr. Dunn, of the Thompson-Houston Company, returned with the Commission, and other electrical men will be in the city, to look after their interests in a few days."

Later news is to the effect that the Commission recommend the acceptance of the Fort Wayne Electric Company's bid of $85,420.

In order to carry out contemplated improvements, the Macon (Ga.) Gas Light and Water Company proposes to increase its capital stock from $500,000 to $1,000,000. Of the new capital $300,000 will be paid in, the remaining $200,000 being held in reserve for future extensions. Not alone the building of new water works, but also the extension of the gas works system will require the new capital. Three miles or more of gas mains are to be laid, and the producing capacity of the works will also be largely increased. The new stock will be subscribed by the Macon Gas Light and Water Company, no outside capital being considered necessary.

An explosion of gas at the works of the Kenosha (Wis.) Gas, Electric Light and Fuel Company, on July 20, resulted in damage to the plant to the extent of $5,000. One man was severely burned and may not recover.

The Van Wert (O.) Gas Light Company has just completed a contract for a large addition to its apparatus with A. D. Cressler, of the Kerr Murray Manufacturing Company, Fort Wayne, Ind.

The Burlington (Vt.) Gas Light Company's contract for the electric lighting of the city has been extended to include the remaining two years of the five embraced in the original agreement.

At the annual meeting of the stockholders of the Municipal Gas Light Company, of Albany, N. Y., held on the 21st ult., the following Directors were elected: Roswell P. Flower, E. C. Benedict, J. Howard King, Robt. C. Pruyn, Wm. McEwan J. E. McElroy and Anthony N. Brady.

At the annual meeting of the Peoples Gas Light Company, Rutland, Vt., the old Board of Directors were re elected, as follows: W. B. Mussey, John N. Baxter, E. D. Keyes, J. W. Gamton, John A. Sheldon and S. M. Willson. The Directors organized by electing Mr. Mussey President and George R. Bottum Secretary and Treasury. N. C. Dye was re-appointed Superintendent. The usual 3 per cent. semi-annual dividend was declared payable 15th inst.

Elections at the annual meeting of the Beverly (Mass.) Gas and Electric Company resulted as follows: President, Hon. John I. Baker; Clerk and Treasurer, Andrew W. Rogers; Directors, Hon. John I. Baker, Sidney W. Winslow, Charles F. Prichard, Herbert F. Winslow and Andrew W. Rogers.

The Board of Public Works of Topeka, Kas., has received a report of the cost of producing all-night electric arc lights in that city, which erected its own lighting plant about two years ago. The statement covers a period extending from November 1, 1889, to June 1, 1891. During that time the highest cost of the standard arc lamp for all-night service was $8.14 per month, and the lowest was $5.38. The average cost of each arc lamp was about $7 per month. The statement which the Board has just received shows the cost of the coal used, labor, oil, carbons, globes, and, in fact, gives every expenditure that was required to keep up the plant.

A proposition to establish a municipal electric lighting plant at Providence, R. I., offered by Alderman Gilmartin, was defeated at a meeting of the Common Council held last week.

A contract for the lighting of the city of Atlanta, Ga., for the 3½ years begining with July, 1st was awarded to the Georgia Electric Light Company, the same company that is at present lighting the city. The 2,000 candle power arc lights are, by the new contract, to cost $100 per year—old price, $120. The price for incandescent lights, 65-candle power, is $40 per year—old price, $48. The contract calls for not less than 250 arc and 500 incandescent lights.

Frequent complaints having been made of irregularities in the public lighting of the city of Memphis, Tenn., it was decided by the City Council, after due deliberation, that the only remedy would be the appointment of a Light Inspector; and this officer was accordingly appointed in the person of Mr. Thomas Dwyer, whose duties consist in the general supervision of all the city's lights, the Council looking to him and him alone to see that the lighting companies which have contracts with the city come up to the letter of their contracts. Inspector Dwyer's duties began the first of the present month. The city's lights all told number 963, as follows; Electric 100, vapor 521 and gas 342, all of which are maintained at an approximate cost of $23,000 per year. Were all lights kept in good condition and burning for the full time contracted for this amount would be increased a few hundred dollars; but the above annual cost is reduced several hundred dollars in rebates charged for inefficient service. This penalty clause is stipulated in all the lighting contracts which the city has. The specified amounts are as follows: Electric lights, two-thirds the cost of each light per night is deducted when said light is reported out for any length of time. For these lights the city pays $10 per month or 33⅓ cents per night for each light, which would make the reduction in case of lights reported out 22 cents and a fraction each. For vapor lights $1.10 each per month is the contract price, the city being entitled to a rebate of 10 cents per night for all lights reported out. Gas costs $1.00 per light per month, with a rebate of 10 cents each for lights reported out.

Secretary and Superintendent Marcus Smith, of the Wilkes-Barre (Pa.) Gas Company, is at it again—helping out electricity by reducing the gas rate. This time the Secretary has put the gas rate at $1.60 per 1,000 cubic feet, subject to the following discounts: On bills under $20 per month, 5 per cent.; on bills over $20 per month, 10 per cent.; on bills over $50 per month, 20 per cent.

We are indebted to Mr. W. S. Humes, Secretary of the Altoona (Pa.) Gas Company, for forwarding, under date of July 25th, the following interesting gas notes from Altoona, which go to show that Messrs. Lloyd and Humes are well up in the business:

To the Editor American Gas Light Journal: I beg to inclose for your information a clipping from the Altoona *Tribune* of to-day, showing what we are doing in the gas business. In addition to the matters spoken of in the clipping we are making considerable extension of gas mains in the city. Notwithstanding the fact that we have two electric

light companies in our city of 30,000 people, we think the gas business is improving. For the last fiscal year we set 315 meters with an output of 56,000,000 cubic feet, and this fiscal year we hope and expect to set 400 meters and have an output of 60,000,000 cubic feet. With the aid of liberal advertising we have done a very large business in the gas stove line, which has had a very perceptible effect on our summer consumption. This, too, in the heart of the cheap soft coal region. Much of the success of our Company is due to the liberal and progressive spirit of our President, Mr. John Lloyd.

The clipping referred to by Mr. Humes is appended;

"The Pennsylvania Railroad Company having purchased the ground on which the present plant of the Altoona Gas Company stands, it becomes necessary for new grounds to be obtained—not only because of the fact that the sale of their present quarters had taken place, but also because the old ground would not admit of an extension of the plant, which had become absolutely necessary on account of the growth of the city. Accordingly the Gas Company has purchased from the Railroad Company a piece of ground containing about four acres and located near First street and Seventh avenue. On this the new works will be erected, and in fact are now under headway and under contract to be ready to manufacture gas on the 15th day of November next. The new works are what are known as a 20-inch coal gas works, of a maximum capacity for manufacture of 750,000 cubic feet of gas every 24 hours. The plant will consist of the following buildings: First, a purifying house 98 feet long by 68 feet wide—a 2-story brick with slate roof; second, a retort house 166 feet 6 inches long by 70 feet wide, 1-story, of 19½ feet high, measuring from foundation, and it will be of brick with iron truss roof and slated; third, office and meter room, in size 35 feet square, two stories in height, built of brick and covered with slate roof; fourth, iron coal shed, 166 feet and 6 inches long and 50 feet wide; this building will be constructed entirely of iron, with sides and roof covered with black corrugated iron, and will have a trestle connected with it by which the cars can be unloaded simply by dumping. In addition to the above there will be a concentrator building and a tar well erected, both of ample capacity. The erection of the first three buildings, purifying house, retort house, and office and meter room, have been awarded to Stoke & Moore, of Altoona, and the iron coal shed to Reter & Conley, of Pittsburgh. The machinery and apparatus of this new plant, which will be the most extensive and expensive part of it, has been awarded to the Kerr Murray Manufacturing Company, of Fort Wayne, Ind. This machinery and apparatus will be of the latest and most approved pattern, with a duplicate set of boilers, exhausters, etc., so that in case of a breakdown there will not be five minutes' delay in the manufacture of the gas. There will be no additional gasholders built at present, as those in use have sufficient capacity to meet the requirements for some years to come. Only last summer an additional lift was put to the large holder on Ninth avenue and Fifth street. The position of the one on Ninth avenue or that on Green avenue will not be changed, but a line of 20-inch pipe will be run from the new works to the large holder on Ninth avenue. The old works may possibly not be abandoned before spring. The erection of the new works is under the personal direction of William Gardner, of Pittsburgh, as supervising architect."

William Wood & Co., the well-known textile manufacturers of Philadelphia, Pa, recently installed a large isolated plant on the Edison system, using as power two 100-horse power Westinghouse compound engines. The whole plant proved satisfactory in an eminent degree, and it is claimed that the engines are not equalled by any others in the city for smooth running. The experience above noted led to the further purchase of a 200-horse power compound as general power in one department of their mill, and a 10-horse power junior for a small relay dynamo. The starting of the large compound engine showed an immediate improvement in both the quality and quantity of the product, due wholly to the refinement of regulation obtained. With the engine which was replaced the throwing on or off of a few looms would make a variation of 2 or 3 picks a minute, while with the close-governing, high-speed engine a steady pick of 90 per minute was invariable under any change of loads, and the looms never 'knocked off' as has formerly been the case. This same result has before been noticed in connection with fine textile manufactures, and has given the high-speed, single-acting engine strong clientage among silk manufacturers especially.

The Houston (Texas) Gas Light Company has filed an amendment to its original charter, fixing its term of existence at fifty years from Oct. 9, 1866.

About two months ago the town of Marblehead, Mass., decided to install an electric lighting plant on municipal account, and a committee was appointed to investigate the different systems. It is now announced that about everything the committee can do is done, arrangements having gone so far as to locate the lights, draw up the contracts, fix upon a site for the station, and ascertain the cost of the plant and the expenses of each light per night. The selectmen will soon be asked to call a town meeting for the purposes of acting on the recommendations of the committee, after which, if they are accepted, it will not be long before the plant will be in operation.

The following is from Kansas City, Mo., under date of July 22:

The future prices for city lighting were determined by the Council last night. This ends a struggle with the question which has lasted for about three years. Not until the past few months, has the Council seemed to act in earnest in regard to the matter, and the result attained last night can be safely attributed to numerous messages from the mayor and the constant goading of popular opinion. The session last night was not without interesting incident. President Cannon of the upper house called Mr. Kimball to the chair in order to express his views on the light question, and his speech created something of a sensation. There were dark intimations contained in portions of it regarding the delay of the Council in acting on the light question, and a crowded lobby listened with almost bated breath. An ordinance introduced by Councilman Manning, which fixed rates for lights during the ensuing year, beginning August 1, was passed by both houses and now awaits the mayor's signature to become a law. The following table shows the present rates, those proposed by Mr. Cannon in a resolution which the upper house passed and the lower house laid on the table, and the new rates adopted by the passage of the Manning ordinance:

	Present Rates.	As Cannon Proposed.	The New Rates.
Electric arc lights.....	$210 75	$126 00	$100 00
Gas lights.....	21 00	15 00	15 00
Gasoline lights.....	27 00	18 60	14 40
Incandescent lights.....	.....	.....	15 00

"Mr. H. Wilkiemeyer, is in harness at the Evansville, (Ind.), works, one of his first duties being to superintend the filling of the new 600,000 foot holder. This holder is said to be the largest in the State, and is certainly a very 'fine looker.' Gas for illuminating purposes is selling in Evansville at $1.50, net, per thousand, and for fuel purposes at $1.00 net. Brother Wilkiemeyer thinks he will like Evansville, 'although it is not Portsmouth.'—A."

On July 22 the Leavenworth (Kas.) City Council granted a franchise to the Merchants Electric Light Company, organized a short time ago with a capital stock of $50,000. The charter fixes the price for the lights on the following basis per month: Arc lights of 2,000-candle power all night, $8; until midnight, $7; until 10 o'clock, $6. Incandescent lights, 16-candle power, all night $1.40, until midnight $1, until 10 o'clock 75 cents; 32-candle power, all night $2.25, until midnight $1.75, until 10 o'clock $1.25; 60-candle power, all night $3.50, until midnight $2.50, until 10 o'clock $2; 100-candle power, all night $4.50; until midnight $3.50, until 10 o'clock $3. Work is to commence within 90 days from date of acceptance and the plant is to be completed within 180 days from date of approval of the ordinance. The ordinance was carefully drawn by City Attorney Dassler and the rights of the city fully protected.

At a meeting of the Duluth (Minn.) City Council, July 23, the City Attorney presented a long communication from Attorney C. N. Bell, of St. Paul, in which the latter states that the City Council never had authority to grant the Duluth Gas and Water Company, or any other company, an exclusive franchise, and that the Legislature could not, if it would, authorize the city to grant an exclusive franchise. It is said that there is a probability of the city now putting in a plant of its own.

At the annual meeting of the stockholders of the California Electric Light Company, of San Francisco, the acts of the Directors during the past year, including the proposition to form a new Company in conjunction with the Edison system, were unanimously approved. The old Directors and officers were re-elected. The Directors are: P. B. Cornwall, Gustav Sutro, Alvinza Hayward, William Kerr, George H. Roe, Ramon E. Wilson and John R. Spring. The officers are: P. B. Cornwall, President; Gustav Sutro, Vice-President; George H. Roe, Secretary; and the Bank of California, Treasurer.

The capital stock of the Alton (Ill.) Gas and Electric Light Company is to be increased from $40,000 to $60.000, for the purpose of erecting a new and larger power house, for which the City Council recently granted a franchise.

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By a competent and reliable man,

POSITION AS METER AND COMPLAINT MAN.

Satisfactory references given. Address

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By Gas Company who also operate an Electric Light Plant. Must be thoroughly competent in all matters pertaining to the construction and operation of the gas works, and also understand steam and have had experience in running electric lights. Must give good references and be a worker. Address, with full particulars concerning themselves and references, also stating salary expected, GAS AND ELECTRIC COMPANY,
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POSITION WANTED

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841-5 "H. H. W.," care this Journal.

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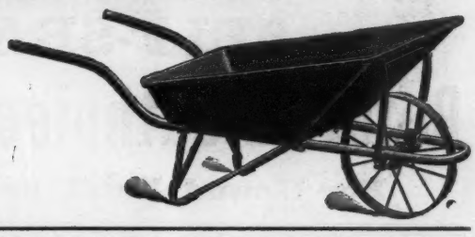

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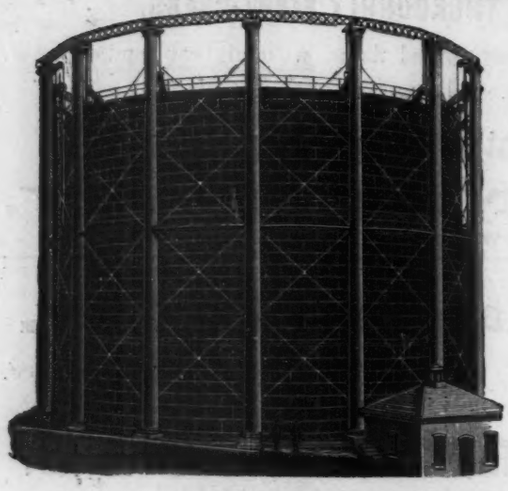

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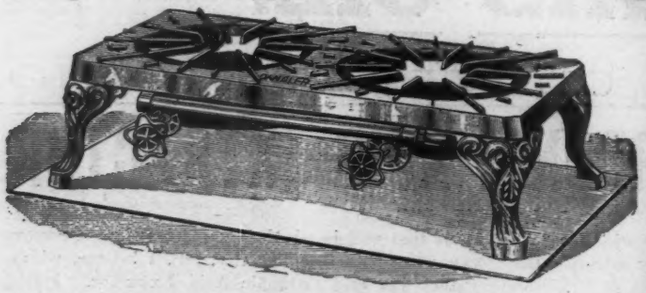

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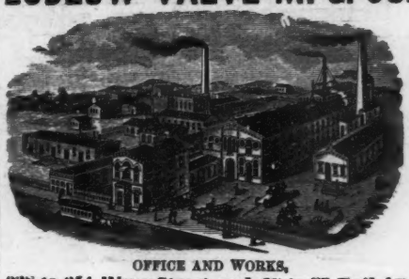

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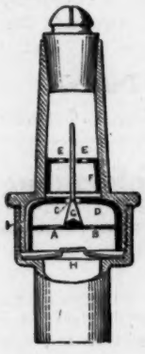

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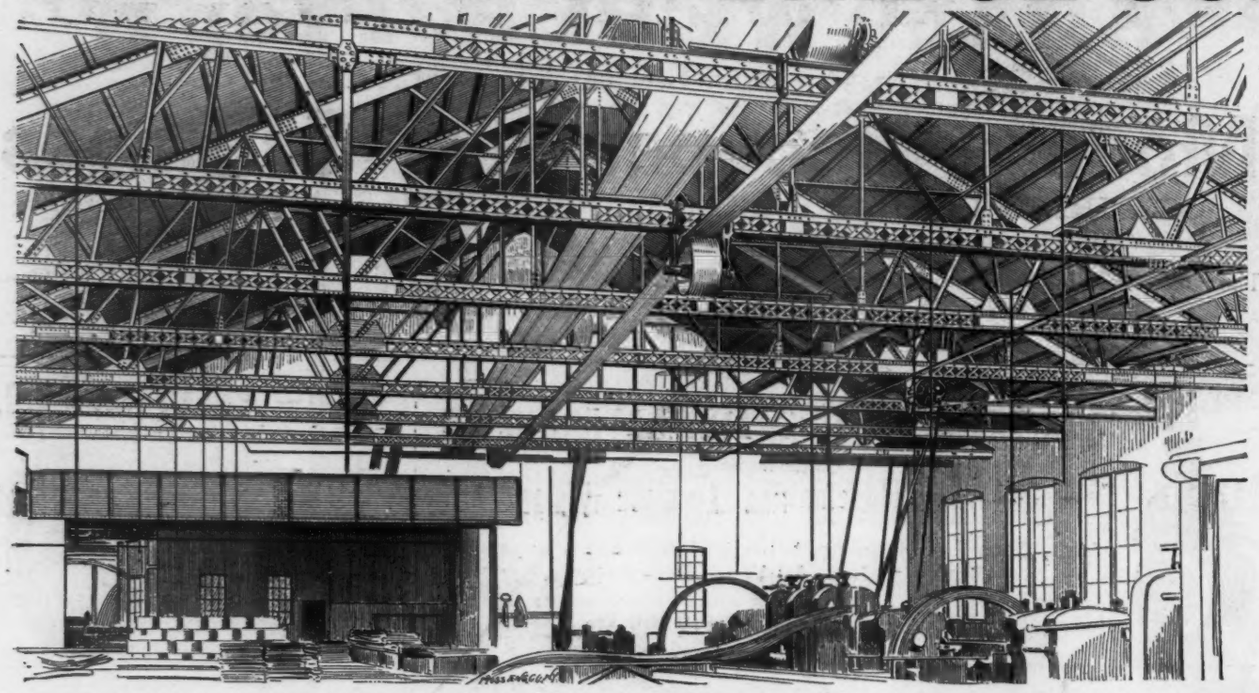

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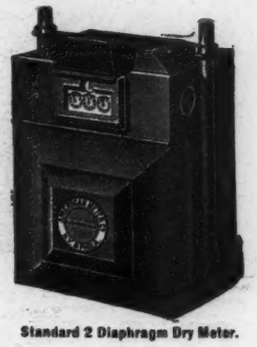

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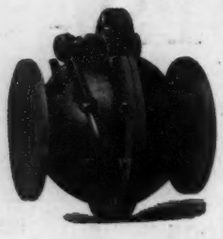

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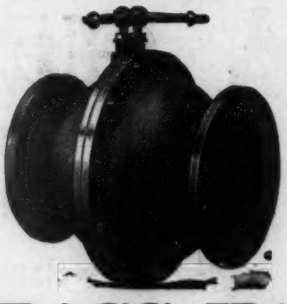

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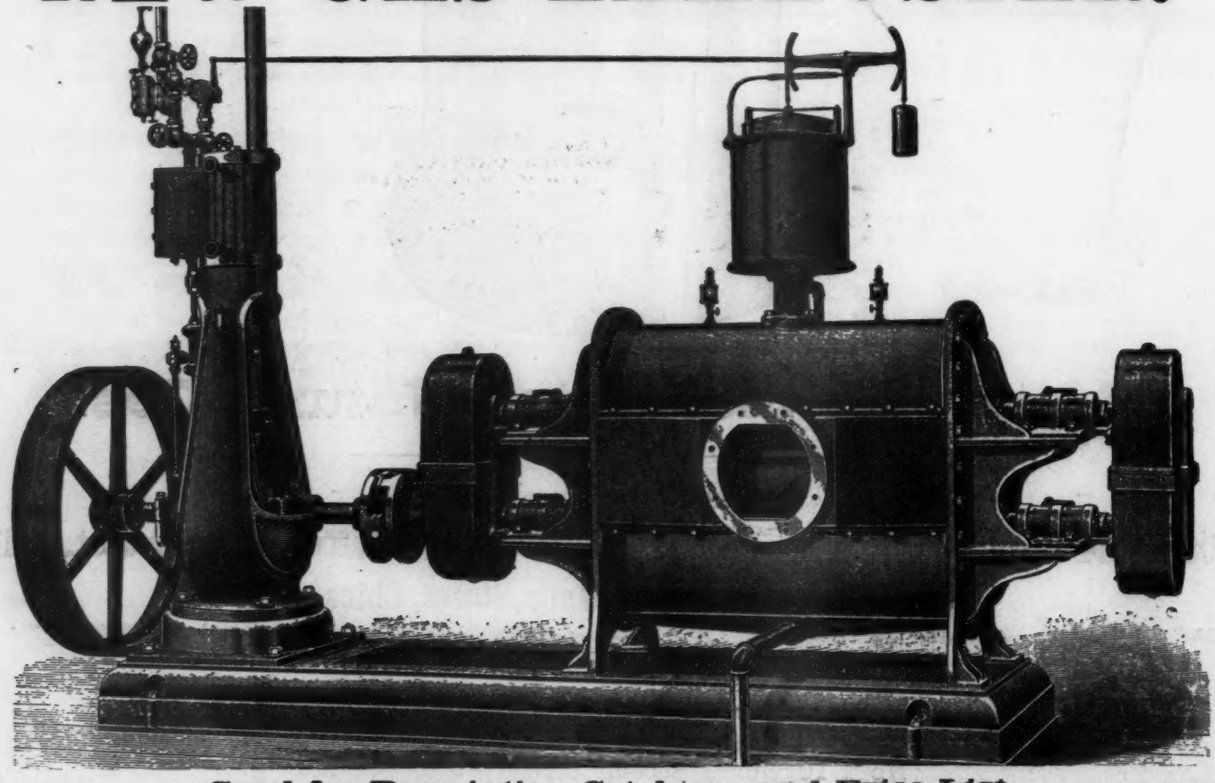

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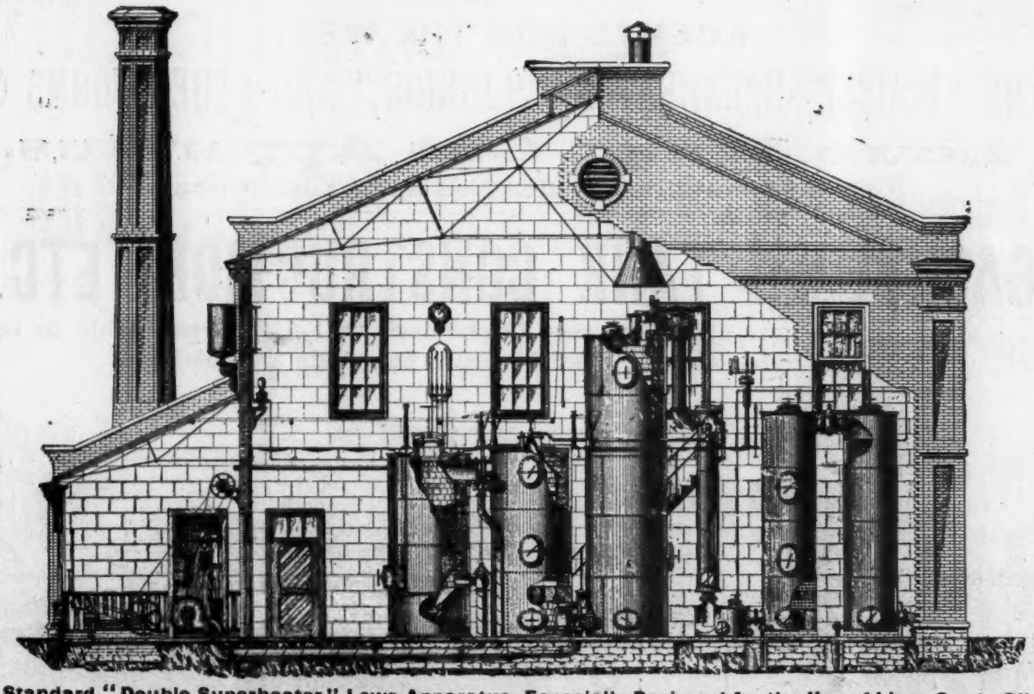

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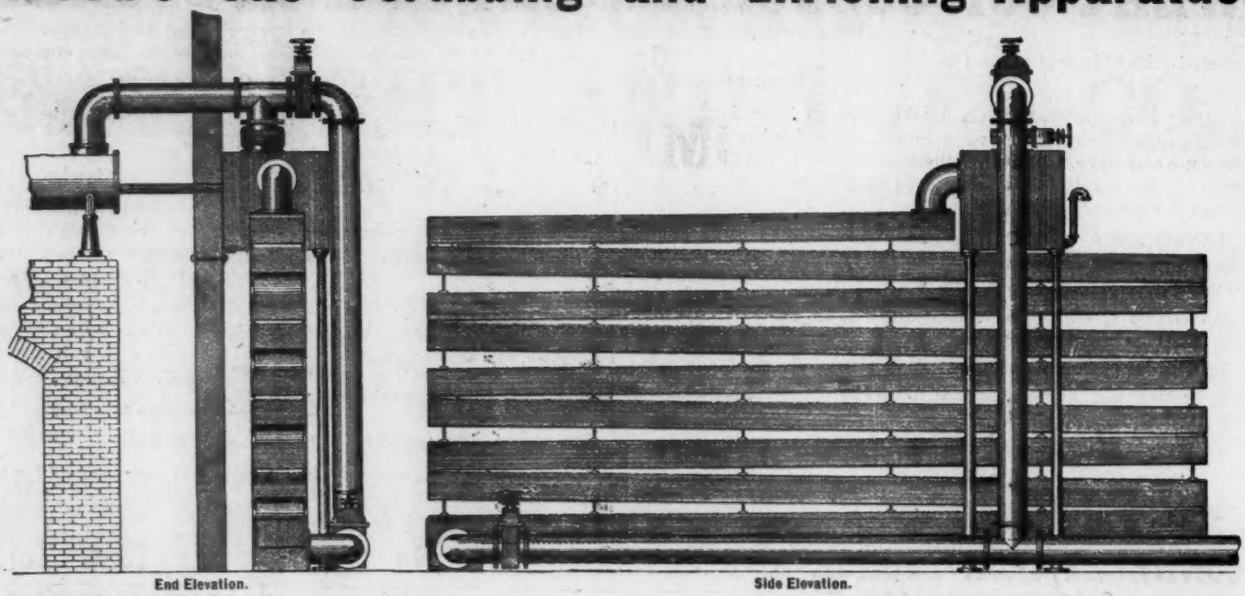

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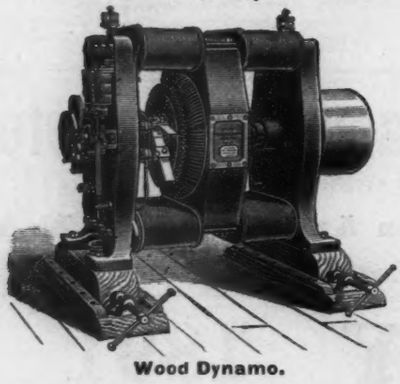

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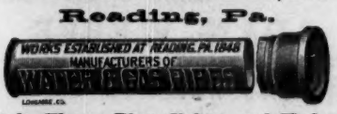

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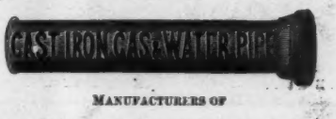

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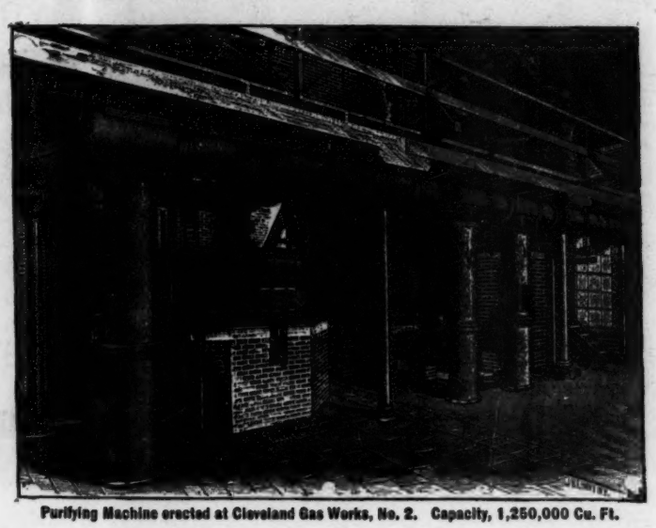

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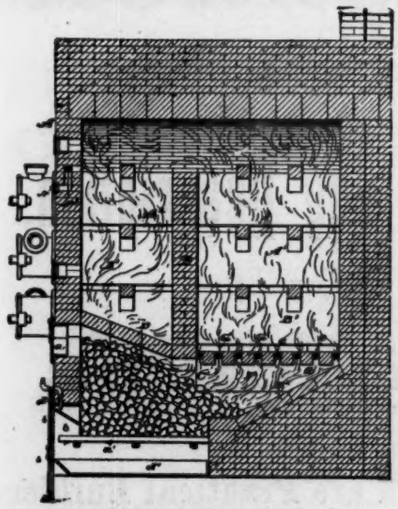

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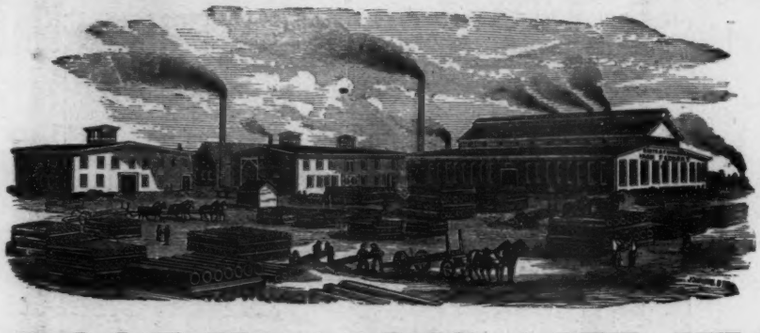

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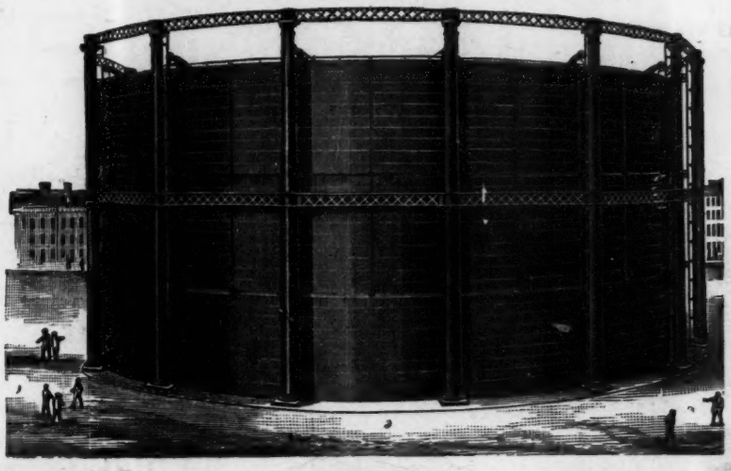

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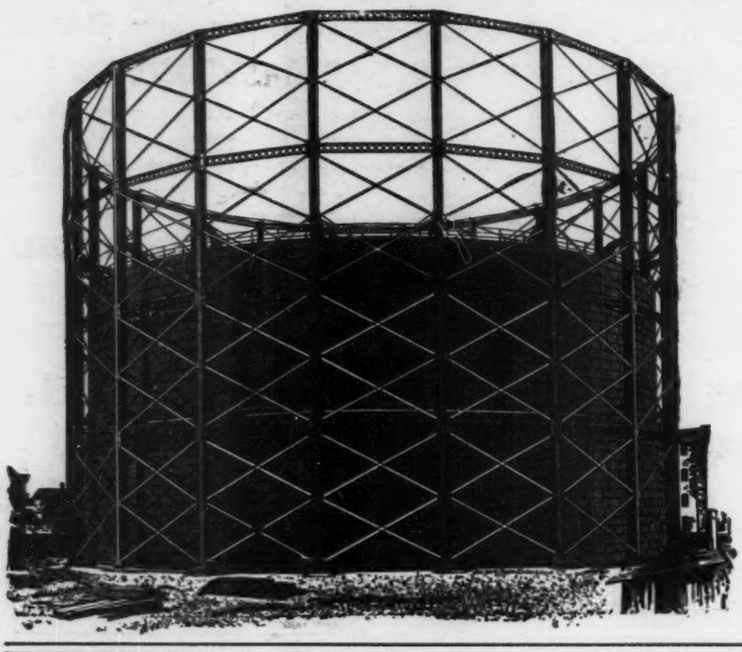

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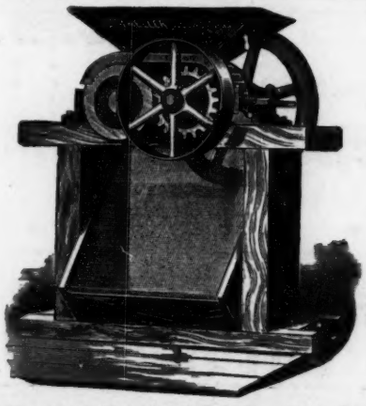

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